THE DENTAL PRACTITIONER

AND DENTAL RECORD

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THE DENTAL PRACTITIONER

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THE DENTAL PRACTITIONER
AND DENTAL RECORD

Vol. X, No. 5 January, 1960

EDITORIAL

SOLVING THE PROBLEM OF THE SCHOOL DENTAL SERVICE

THE manpower problem in the School Dental Service continues to cause alarm. There has always been a shortage of dentists in the school clinics. It was hoped that the National Health Scheme would produce the cure. It certainly has not.

In a report Slack says: "The Annual Report of the Chief Medical Officer on the State of Public Health (1958) and the Report of the Child Medical Officer on the Health of the School Child (1958) make no bones about the matter. In England and Wales, according to the census, there are 10,261,000 children under 15 years of age, of whom about 6,700,000 are of school age. Against this number of children the approved establishment of dental officers in 1956 was the equivalent of 1091 full-time staff, of whom 404 full-time officers are over 50 years of age and yet only 91 are under 30 years of age." It is undoubtedly a mammoth problem.

Where does the solution lie?

From time to time people say ineffectually that the Government must do something. This, however, would not seem to be the answer. Surely it must come from the profession itself, from the general practitioner, through his representatives on the various bodies that control the profession's future. If they offer a wise solution, then it is reasonable to assume the Government will back it. But the first move must come from the profession.

And is not this moment the golden opportunity? By the end of 1960 the "call up" of dentists for their National Service ceases. The National State of Emergency will have ended. But we will still have with us the State of Emergency in the School Dental Service. Every graduate, as part of his prerequisite to practice, could be required to serve for a period of at least one year in the school service. A requisite such as this is not unusual; it is in force in other countries.

There would of necessity be certain permanent and temporary exemptions as there have been with the National Service. Entering the armed forces would have exemption, provided it was for a period equal to or longer than the School Service, and those taking higher qualifications or doing recognized research could obtain deferment.

The advantages to the graduates could be enormous. The benefit of working under the supervision of S.D.O.'s cannot be underestimated. The opportunity of practising what they have been learning, obtaining speed of working, experience of handling staff, and

[*continued on p.* 113]

PREMEDICATION AND ANÆSTHESIA

SOME RECENT IMPROVEMENTS

By **S. L. DRUMMOND-JACKSON**, L.D.S. R.C.S. (Edin.)

It is strange to consider that our ultimate target is to render general dentistry obsolete, and that the discovery of, say, a simple "x-fluoride" could dwindle the profession within our lifetime to little more than orthodontia, oral surgery, and a decreasing amount of prosthetics. Meanwhile, we may enjoy that endless interest and fascinating variety which are often the envy of specialists in more circumscribed branches of medicine. Our more immediate target is perhaps to do our work under the best possible conditions. Short of freedom from dentistry, most patients would include in their ideal the removal of pre-operative apprehension, and freedom from pain and discomfort, both during and after treatment.

Some practitioners achieve such an ideal on frequent occasions by the confidence of good patients—by especial skill and gentleness in working, or by the use of medication, local or general anæsthesia, or hypnosis.

To those especially interested in medication and general anæsthesia, many problems remain. Children, nervous and "resistant" patients are high on the list. The main fields in which one seeks to improve conditions for these and also for less difficult patients are those of premedication and of the most suitable induction and maintenance of anæsthesia.

PREMEDICATION

In recent years the vast number of new drugs introduced to the market is far beyond the powers of general practitioners to assess. We come to rely on one or two tried favourites, and if these work moderately well it seems wrong to experiment with new drugs on our patients. Indeed, the individual factors would operate against most of us obtaining data of general value. This individual factor is exemplified by the number of practitioners who find a certain drug to be invaluable, but with which some of their colleagues cannot manage to achieve success.

Methylpentynol (Oblivon): Methylpentynol Carbamate (Oblivon-C).—This drug is a typical example. When first introduced, the dosages recommended were inadequate. Though it was successful in some instances, the percentage was not high, and the action was short, coming on about fifteen minutes after administration and lasting an average of twenty minutes.

To achieve a less temporary effect the more slowly-absorbed methylpentynol carbamate was evolved. Its action became effective about an hour to seventy-five minutes after administration, with a correspondingly greater cover over the next hour or two.

Trotter (1954), Galley (1958), and Doughty (1959) did much to enable this drug to receive a better evaluation. The dosages now recommended would be considered massive compared with those used in 1953. For children, the elixir is given in doses of one teaspoonful (250 mg.) per stone body-weight. For ambulant adults the shorter acting methylpentynol is prescribed in doses of 175–250 mg. per stone body-weight, while Dr. Galley found, in personal tests, that 100 mg. of the carbamate per stone body-weight (1 g. for a patient of 10 stone or over) was the adequate dose.

Several notable advantages over the barbiturates have been discovered, the main one, perhaps, that effective and tolerant sedation can be produced without hypnosis. One remarkable finding in a prolonged series of tests was that volunteers given methylpentynol, or methylpentynol carbamate, demonstrated an increase in mental alertness comparable with that expected from a mental stimulant rather than a "sedative". The patients were also more co-operative as well as being less doped, and there was no question of the building up of any "hangover" which may have operated against the best application

of any subsequent anæsthetic agent. In some cases the substantial euphoria experienced necessitated some degree of supervision. For example, the patient who took an adequate premedicant dose before his appointment may well feel sufficiently carefree and irresponsible to take risks in traffic or with machinery, or even to chatter much more freely than would normally be considered wise. In discussing some of these points, a well-known medical anæsthetist said that he had found himself playfully pinching two of his nurses—adding that he would never have dreamt of doing such a thing at any other time. It seems clear that this agent has brought about some appreciable improvements, especially in the handling of children—and some added responsibilities. It is not mentioned in the literature but there is little doubt that alcoholics would require larger than average doses, and there will be patients for whom the drug is unsuitable, but a most important finding is that in many thousands of tests no side-effects or other complications connected with its use, or the subsequent use of other anæsthetic agents, have been found.

Perphenazine (Fentazin;* Trilafon†).—Professor Allen Dobkin (1958), of the University of Saskatchewan, who has carried out extensive research on the effects of recently-introduced ataractic drugs, has selected perphenazine (Dobkin, 1959) as the drug of choice for premedication. This drug provides good sedation without reducing mental alertness or blood-pressure, and reduces salivary secretions. It also reduces the gag reflex and the undesirable effect of epinephrin when injected into the mouth with local anæsthetics. For the very nervous patient it is suggested that 5 mg. of perphenazine be combined orally with 200 mg. meprobromate about one hour before treatment.

INDUCTION OF ANÆSTHESIA

For some years there has been a gradual advance in employing the comparative luxury of the intravenous route for induction of suitable patients: this advance has been more substantial in the United States than in Britain. Many problems have been solved, and some remain. A new drug at present undergoing extensive clinical trial in the U.S., and, to a lesser extent, elsewhere, gives promise of the removal of one of the greatest remaining barriers, that of the longer recovery.

During the last few years I have had the opportunity to carry out clinical trials on five new short-acting intravenous anæsthetics, but in no instance until now have I felt justified in publishing any report, as the advantages over thiopentone did not seem to be of outstanding practical value.

As so little has been published, it may be of interest to mention briefly two of the main problems already solved in this country.

Local Complications.—Though the hazards of perivenous and arterial injection were well recognized, the literature almost exclusively dwelt on the measures—often heroic, and probably impractical for one who may have got into trouble by faulty technique—to be taken in the event of such an emergency. In 1954 a simple but meticulous regimen, quite suitable for dental and out-patient practice, enabled these risks to be avoided completely. Following the description of this routine it is now taught that in dental practice perivenous and arterial injection are to be considered technical faults, the immediate recognition of which is obligatory.

A film of the steps necessary to achieve such safety was made by Dr. H. Mandiwall and me (Drummond-Jackson and Mandiwall, 1954) and is now used by a number of bodies for the instructive guidance of the general medical and dental practitioner. Briefly, by employing all-glass syringes with short fine needles, and using a simple momentary withdrawal technique, blood can be withdrawn to the syringe nozzle as often as required during injection to "proof" the correct intravenous position. The whole procedure can be so refined that no needle prick or pain of any kind need be inflicted, thus making the technique acceptable to suitable child patients as well as the very nervous adult.

Laryngeal Spasm.—The hazard of laryngeal spasm was greatly reduced by introduction of

* Allen and Hanbury in U.K.
† Schering in U.S.

the moist flange vestibular mouthpack. Made of fine-cell compressible cellulose, sterilizable by boiling or autoclaving, this pack protected one half of the mouth only, by means of a double flange. The junction of the flanges was positioned far back on the ridge of the side of operation. The internal flange—which provided the main protection—covered the lingual side of this half of the mouth, hugging the palate above, and being tucked down between the tongue and the mandible below. Positioned correctly, this flange resisted displacement by normal dental procedures, the location being assisted by the outer flange on the buccal side. Inhalation of even the finest particle of tooth debris was thus prevented, and tests with the pack showed that appreciable amounts of even heavy amalgam dust from drilling were otherwise inhaled on the air-stream. When full protection of both sides of the mouth was needed, two such packs were positioned, and with both in place the tongue could still be protruded beyond the lips without the packs being dislodged, the two flanges coming together again as soon as the tongue was retracted.

The main advance in light induction anæsthesia with the short-acting barbiturates has been that since the routine use of these vestibular packs the incidence of laryngeal spasm has undergone dramatic reduction. The sudden type of spasm—Nature's protection against the entry into the bronchial tree of any foreign matter—was already rare due to improvements in technique. Since routine use of the flange packs I have had a spell of over 2000 consecutive administrations without a spasm. The strict regimen nowadays practised, of commencing protective action at the first sign of a modified inspiration, prevents the development of what otherwise might have become a hypoxic spasm. Similar figures of safer administration should, in a few years, cause a revision of opinion as to the causes of laryngeal spasm in minimal sleep inductions by the intravenous barbiturates. It can be said with authority that in such use these drugs are not spasmogenic, as was once thought, and in due course their property of not inhibiting the protective laryngeal reflexes will undoubtedly be hailed as a valuable factor of comparative safety. A short film (Drummond-Jackson and Mandiwall, 1955) describes the method of use, which was first reported in this JOURNAL (Drummond-Jackson, 1954).

The recent use of high-speed drilling techniques with the increased inhalation hazard of ultra-fine debris has extended the use of these packs to everyday conservation on the conscious patient, as the material is well tolerated, cannot become entangled by drills, and affords complete protection without discomfort. It is an accidental advantage that the flanges prevent the area becoming moist by collecting directly from the orifices of all three glands, the packs being changed before they become saturated. Some attention will soon have to be paid to the inhalation dangers to the operator, as well as to the patient, as examination of used packs shows dramatically the appreciable amount of debris which must be exhaled, as well as inhaled, by the patient, though that which is exhaled is unfortunately not so simply demonstrable.

It should be mentioned, in fairness to some hundreds of responsible dental practitioners interested in learning safe venopuncture, that such remarks as "fools rush in . . ." if directed at them would be most unfair. In this country the studious, careful approach has been reflected in the excellent record achieved, and this, not personal opinion, is the only acceptable basis for any worthwhile appraisal. The study of intravenous techniques is naturally a postgraduate one for those with experience of general inhalation anæsthesia. Any dental practitioner wishing to improve his methods of administration of the inhalation agents may apply to attend one of the postgraduate courses conducted by Dr. Victor Goldman at the Eastman Dental Hospital. Those interested in the intravenous technique may apply to attend one of the courses conducted by the Society for the Advancement of Anæsthesia in Dentistry by a team of five lecturers.

The intravenous induction still remains a comparative luxury for the few. Before wider use can be made of this valuable method, one of the main problems to be solved is that of the

longer recovery. After even a short sleep-induction by thiopentone, full mental alertness is not regained by some patients for an hour or more. The time requirements all round and the expense of arranging proper post-operative control limit its usefulness in the busy general practice. Further, to safeguard all, strict rules must be observed by all—no driving, operating machinery, or important business discussions until the following day, which is often an inconvenience.

METHOHEXITAL SODIUM

This is a necessarily brief preliminary report confined to one practical use of interest in dental practice.

Methohexital sodium is an oxygen barbiturate (the sulphur radicle in position 2 is replaced by one of oxygen). Its potency is approximately two and a half times that of thiopentone in that a person requiring a sleep dose of 200 mg. of thiopentone sodium would probably require but 80 mg. of methohexital sodium. When mixed the solution is stable for several weeks at room temperature. It is manufactured by Eli Lilly of Indianapolis, and clinical trials have now been proceeding for over two and a half years, though at present there is no date announced for its general release in the U.S., and its availability in this country cannot therefore be expected for some months.

The main claim made for this drug is that its action is shorter than thiopentone, and recovery of mental faculties is regained in a much shorter time. All those reporting so far on the clinical trials of methohexital sodium are agreed that this claim is justified. If so, this will be of especial interest for those who desire a smooth and speedy simple induction of anæsthesia preparatory to maintenance by one of the inhalation agents. The greatest advance achieved will be the ability to provide short simple anæsthesia, even in the resistant patient, without the temptation to restrict oxygen. Satisfactory fully-oxygenated anæsthesia is a goal which every anæsthetist wishes for every one of his patients, not just the model ones. Hitherto the slower elimination of thiopentone has outweighed the advantage that within thirty seconds of the commencement of injection, a quietly anæsthetized patient could be under operation while a maintenance inhalation mixture containing at least 20 per cent of oxygen enabled the anæsthetic to be continued for any reasonable time without the risks associated with oxygen restriction.

My own trials of methohexital sodium have been directed to comparing its action with thiopentone in simple induction dosage only, not followed by any maintenance of anæsthesia. In this way it was hoped to obtain much more valuable knowledge of the simple process of elimination uncomplicated by any possible effect of premedication or accessory drugs.

A series of 200 patients was selected, all of whom had previously been given a similar induction dosage of thiopentone, and for whom records of anæsthetic effects—dosage and timings of the various stages of recovery—were available.

In dental practice it is of particular interest to know not only the initial recovery time, but how long it will be before a patient is sufficiently responsible not to require skilled supervision.

The tests were therefore timed as follows: The stopwatch was started at the commencement of injection. The rate of injection was approximately 10 mg. a second. The necessary induction dose was estimated from previous records of thiopentone inductions. If for any reason the injection was interrupted, or if the estimated dosage was insufficient to produce operable anæsthesia, the figures were not included in this series.

The time at which the anæsthetic state was reached was first recorded. The lash reflex was at first used to define this point, but it was soon discovered that an operable state for the momentary task could be produced without loss of the lash reflex in some cases. The duration of threshold anæsthesia was gauged by return of the lash reflex or by reaction to painful stimulus. In some cases where the operation was much shorter than the available time, an estimate had to be made, rather shorter than actual, as undoubtedly the stimulus of any operation speeds recovery as with the other barbiturates. The ability to

open and close eyes and mouth, and to answer simple questions was recorded, but the most important timing was the final one of "walking unaided".

It was considered that a more difficult test than those usually applied should be devised, first to eliminate the patient who could momentarily pass a simple test by special effort, and secondly to obtain a more useful indication as to when a patient could be reasonably handed over to the care of a friend, even though not allowed to leave the premises. To pass the "walking unaided" test, therefore, a patient could be assisted to rise from the chair but then, after standing steadily, he must walk across the room, out through a door, turn and re-enter the room, and cross to the dental chair again without touching the door or anything else *en route*. If he appeared at all unsteady, then the test was repeated and the second timing taken.

The estimated dosages were not always correct. Though the "too little" group were eliminated, there were many patients who could well have received less than was given. As this would happen in every practice for initial injections, and also subsequently if inhalation maintenance was used which would mask the initial reactions, the figures were all included.

The results were quite remarkable. In the whole series there was no complication. Two patients took over 8 minutes to pass the "walking unaided" test, both having been given more drug than was needed. Five patients whose records had been marked to show unusually delayed recovery after thiopentone gave no sign of delayed recovery, nor did they have any after-feeling of tiredness. It must be pointed out that the whole group were normally healthy patients who would be considered fit for a general anæsthesia, though there was not otherwise any selection.

Over the 200 cases, an average of just over one minute of "operating time" was available —enough to do many essential emergency jobs in dental practice which would necessitate a short anæsthesia.

The longest time taken to pass the "walking unaided" test was 8 minutes 40 seconds—6 minutes 45 seconds after recovery of the lash reflex. The average time over the whole series was less than 4 minutes after completion of operating, a figure which has never before been approached. In other words, all of these patients need only have been in surgery for an average of 6 minutes after the start of induction—by which time most of them would not have been asleep had a fully-oxygenated nitrous oxide induction been selected.

Perhaps the next most interesting feature learned about this drug for such use (near-minimal induction) was that patients did not feel mentally slow afterwards. There was little desire to rest in the recovery rooms. My personal experience and that of colleagues was similar. First, there was no suspicion of the sulphur-taste sometimes experienced during a thiopentone induction. The usual ignorance of having been asleep at all was followed by a quite natural wide-awake feeling, without euphoria. The euphoria after alcohol, methylpentynol, thiopentone, or other drug is enjoyable if under proper control, but it is this effect, rather than the slowing of reflexes, which in some people constitutes the main danger—that of taking an irresponsible risk.

To some patients who had come to enjoy the relaxation of their post-operative resting period after a short thiopentone anæsthesia, the new drug was not attractive as their usual rest was not needed. To the surgery staff, however, the freeing of supervision time for more productive use, and even the release of recovery-room accommodation, compared most favourably with former routines.

It is naturally early yet, on such short acquaintance, and with such a circumscribed series of tests on such a comparatively small number of patients, to give any considered opinion. I am satisfied, however, from observation of the work of several investigators in the U.S., and my own limited experience during the last few months, that methohexital will enable a great advance to be made in the induction of anæsthesia for the ambulant patient.

MAINTENANCE OF ANÆSTHESIA

Halothane gives promise of being the most useful agent yet available for the maintenance of anæsthesia. For induction it cannot compare

with the shorter-acting barbiturates when conditions and patients are suitable; but when they are not, it seems that halothane will deserve to be considered also the induction agent of choice. The qualification is made because of its high cost.

It seems fair to consider the cost of halothane as its main disadvantage. If the problems of oxygen restriction during anæsthesia could be solved, the greatest step forward in anæsthetic safety since the discovery of anæsthesia would have been made. It is of little use this advancement being available to the few. It must be generally available, and applicable with all its advantages to the older practitioner and in the small town practice.

If the economic side is neglected, then one cannot hope to make anæsthesia safer throughout the land, which is the only true target. If it should be, as seems probable, that halothane can provide the solution, and increased production does not place it within reasonable reach of all, then there seems to be a much more worthy case for a government subsidy than for many existing subsidies.

It has been proved that so long as the vapour strength does not exceed 1 per cent, which is adequate for most dental anæsthetic requirements, halothane is safe for dental use without more precautions than are normally expected when using a true anæsthetic agent. Equipment has now been produced which will control the vapour strength at this safe maximum without heavy initial expense, and this is now gradually being made available.

The clinical advantages of halothane can be stated simply. By its use in vapour strength not exceeding 1 per cent with nitrous oxide (80 per cent) and oxygen (20 per cent), most "gas resistant" patients can be controlled without restriction of oxygen. Within accepted limits the duration and depth of dental anæsthesia may be balanced according to the art which differentiates the experienced from the inexperienced administrator. Their differing results will no doubt continue to affect operating conditions, but in any event the safety of the patient can be better assured if the temptation to draw on his vital oxygen supply to keep him unconscious is removed.

CONCLUSIONS

Naturally, the above notes apply only to the healthy patient who is normally considered fit for a general anæsthetic. The administration of longer anæsthetics, and of any general anæsthetic to patients whose history or examination suggests that they may be doubtful risks, should be under the supervision of the skilled anæsthetist. In the larger cities this is no problem, but in the smaller centres it is still a very real problem. Anæsthetic agents and adjuvants may have advanced greatly in recent years, but they will always remain but agents—agents which can be used to improve the lot of the patient and to facilitate the work of both anæsthetist and surgeon, or agents which can be misused with dire results. A powerful car is neither more dangerous nor safer than a runabout. The responsibility, care, and experience of its driver fully determine its safe function. Nevertheless, there is no bar to the responsible practitioner learning to use the newer drugs and techniques. If only those with long experience were to use them, it would be a catastrophe for the next generation. Every anæsthetist of experience has had to learn from the start—chiefly by experience in his own training—and few would deny that the main attributes to success are those essential qualities of responsibility and care, with that interest which enables useful observation to be made on which to build experience.

PROGRESS ADVANCEMENT

In another twenty years the drugs and methods available at present may seem almost medieval. But the signs of continuing advancement are healthy in their variety.

Recently, a small television scanner has been invented by the U.S. Navy Medical Department. It is understood that with it one can examine the inside of the mouth of a patient. With little modification such a device may soon render the laryngoscope obsolete—but for the economic barrier.

The Association of Anæsthetists of Great Britain recently announced the award of a 200 guinea prize, the greatest such prize ever offered, for original research work leading to better dental anæsthesia.

The Russians have produced the Elektroson, an "Electric Sleep Portable Apparatus" according to the literature. Though it is understood to induce sleep for treatment of headaches and insomnia, and pre-operatively and post-operatively in surgery, the makers state that they do not know of any machine "with uses in removing the pain from dental procedures".

Nevertheless, such progress directs our thoughts immediately to the possibility of successful and safe electric anæsthesia, which has already occupied much research. To be able to "switch" a patient to a desired depth of safe and quiet anæsthesia without any physiological modification would have a much greater effect on dental practice than in the hospital. It may also have the sad effect of depriving us of many of our present absorbing interests—and controversies. Whatever improvements are "just around the corner" it seems most unlikely that our successors can look forward to as much interest and variety as we are able to enjoy at the present time.

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A SIMPLE SPRING FOR BUCCAL MOVEMENT OF PALATALLY DISPLACED TEETH

By **J. D. ATHERTON**, B.D.S., D.D.O.

PALATALLY displaced teeth will often move buccally into correct alinement spontaneously if sufficient room is created and there is no cuspal interference. There are, however, a number of removable appliances available for use in those cases where one is deemed necessary.

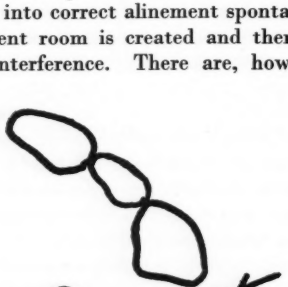

Fig. 1.—Illustration of spring to move a premolar buccally.

The Badcock type of screw plate can be used to move one or more teeth buccally, but when it is used on one or two teeth, for example in the premolar region, it is bulky, occupying a large amount of room in the palate, and is uncomfortable to wear.

Cantilever springs are used, but in the premolar region it is difficult if not impossible for the patient to pass the tensed spring over the displaced tooth in order to insert the plate. Another spring sometimes used is the "flapper" spring, but its application is limited.

A simple and efficient method is to use a "double cantilever" spring in either 0·5 or 0·6-mm. wire, bending the terminal end out buccally between the teeth as shown in the illustration (*Fig.* 1). In order to insert the plate the patient compresses the spring clear of the displaced tooth by pressing palatally on the buccal extension.

THE USE OF CENTRES OF GRAVITY IN CEPHALOMETRIC ANALYSIS: A PRELIMINARY REPORT

By **SQUADRON LEADER J. S. JOHNSON**, M.Sc., L.D.S., R.A.F.
Royal Air Force, Bridgnorth, Salop

INTRODUCTION

In recent years, orthodontic diagnosis has been aided by studies in cephalometrics. Wherever possible, craniofacial measurements have been taken of relevant distances and angles. For significant results, measurements have been based upon two main factors:—

1. The establishment of one or more fixed points as positions of reference.

2. The existence of significant variable points in their relationship to the positions of reference.

The majority of these measurements have been made upon bony anatomical points projected on extra-oral X rays taken in a cephalostat. The choice of fixed points has been limited to the more readily observable geographical positions, or to normal centres of growth and ossification. However, experience has shown that few bony points can be sufficiently fixed in position, in relation to the variable points, also that regions of growth occur as areas rather than as points, are spasmodic in behaviour, and may not be constant from individual to individual, nor from ethnic group to ethnic group. It is evident that no fixed point is fixed in the absolute sense, but that some points are less subject to variation than others. It is for this reason that the use of mathematical points is recommended in cephalometric studies.

One fixed point on an irregularly shaped two-dimensional projection is its centre of gravity. This point is a measure of central tendency. As such, it represents the mean of a myriad of minute variations. A true mean should fulfil a number of conditions, which are listed below:—

1. It should be rigidly defined, so that results will be consistent from observer to observer.

2. It should be based upon all the observations made.

3. It should possess simple and obvious properties to render its general nature comprehensible, and should not be too abstract in nature.

4. It should be capable of calculation with reasonable ease and rapidity.

5. It should be as little affected as possible by fluctuations of sampling, so that one average should not show greater differences than another.

6. The measure chosen should lend itself readily to algebraical treatment.

It will be seen that the centre of gravity fulfils the conditions laid down in most of these six points.

1. Definition.—The centre of gravity is that point around which a body hangs freely in equilibrium when it is suspended in a gravitational field.

2. Ubiquity of Observations.—In the two-dimensional projection of the skull, all the minute variations in two planes are represented by this centre. The third plane, the lateral plane, is not represented, and studies must normally assume that the skull is bilaterally symmetrical. The centre of gravity of a solid skull would be found a little posterior to that on an X ray, due to the greater posterior mass of the skull. In the anterior part of the skull the lateral width is less, and mass is further reduced by the presence of air spaces.

3. Properties.—The centre of gravity is a very precise point in a body or area of any degree of irregularity. Its properties are based upon the principle of moments. This principle states that the moment of the whole is equal to the sum of the moments of the parts. Thus, if the projection of the head is divided into functional or embryological units, and their separate centres of gravity calculated, all the

parts are mathematically related to the total centre of gravity. The total centre of gravity lies in closer proximity to the greater component areas than to the smaller areas.

4. Ease of Calculation.—The centre of gravity is determined relatively easily by suspension, the main difficulty being in the preparation of a cut-out projection of the skull.

5. Fluctuations of Sampling.—The centre of gravity possesses many of the qualities of a mathematical mean. As such, it is stable, and little affected by fluctuations in sampling. Should an individual present an abnormality in the architecture of his skull, the abnormality will tend to be absorbed, and the centre will deviate only slightly. Skulls can be compared by superimposition on the centre.

6. Algebraic Qualities.—In a clinical practice, it is necessary that mathematical treatment be reduced to a minimum. However, the mathematical qualities are simple and well defined, and few calculations are required.

METHOD

A tracing of the outline of the skull is made. Commencing at the basion, the outline is drawn peripherally as far as the nasion. The anterior border of the vomer bone is traced to its junction with the maxilla, and then forwards to the anterior nasal spine. The tracing is continued to include the anterior outline of the maxilla, including that of the upper central incisor teeth, then the lower incisor teeth and around the periphery of the mandible to the condyle and coronoid process. The line continues over the floor of the maxillary antrum back to the anterior nasal spine. The occlusal plane is traced back to the anterior border of the ramus to join the line tracing the periphery of the jaws.

From the basion, the outline of the base of the skull is carried forwards and upwards until it joins the line descending from the dorsum selli. The sella turcica is traced, and the opacity of its anterior border is followed forwards and upwards to its junction with the posterior border of the frontal sinus, and from there to the superior apex of the frontal sinus.

Finally, a second and separate tracing of the outline of the jaws is made.

The skull is now divided into the three functional zones:—

1. The cranium;
2. The face;
3. The jaws.

The jaws are divided along the line of occlusion.

The tracing is now retraced through carbon paper on to fairly stiff cardboard, of even thickness, and the outline cut out. The cardboard outline is suspended in front of a mirror by a pin, to which is attached a length of weighted cotton. The vertical line is marked, and obtained in a second plane. The point of junction is the centre of gravity.

The cranial part is separated by cutting along the line separating it from the remainder of the skull. The 2 halves are suspended in the same manner, giving centres of gravity both for the cranium and for the face and jaw region. These form the second most stable points of the skull. Further centres of gravity are obtained along appropriate lines for the nasal region, and the 2 jaws together and separately.

DISCUSSION AND RESULTS

In a study of this nature, it is necessary to establish the relationships of the component sections of the skull to each other. The three basic skeletal relationships here are:—

1. That of the face and jaws to the cranium, determining profile.
2. That of the jaws to the remainder of the skull.
3. That of one jaw to the other.

These relationships may be assessed in their anteroposterior relationship, in superior–inferior relationship, and in degree of rotation.

The preliminary results were obtained from the X rays of 50 children aged 8–12 years, 25 of whom were English, and 25 Chinese from Singapore.

The Basic Triangle CJN (*Table I*).—The basic triangle CJN connects the centres of gravity of the 3 component regions of the skull (*Fig.* 1). It gradually increases in size with age, with growth of the skull. The

greatest increase was in the distance NJ, representing the downward growth of the face. This increased by an average of 0·5 cm. in the 2 groups of children. The smallest increase was found in the distance CN, and was only 0·2 cm.

In a sense, the line NFJ may be said to rotate about this plane, and so the angle TFN is a useful indicator in the assessment of facial profile. A prominence in the middle part of the face would be expected to result in an increase in this angle. A retrusion of the middle part of the face, or a protrusion of the jaw region, would result in a decrease in this angle.

Table I.—THE BASIC TRIANGLE

	English			Chinese		
	Mean	Standard Deviation	Standard Error	Mean	Standard Deviation	Standard Error
			Length in Cm.			
CJ	11·6	0·46	0·09	11·6	0·41	0·08
CN	8·2*	0·37	0·07	8·0*	0·28	0·06
NJ	4·8*	0·32	0·06	5·0*	0·05	0·05
			Angle in Degrees			
NCJ	20·2	1·5	0·3	20·6	1·4	0·27
CNJ	123·4	4·6	0·9	124·6	3·6	0·73
CJN	36·4*	3·2	0·6	34·8*	2·7	0·53

Statistical significance of difference: *=Probably significant.

The Plane CTF, and the Measurement of Profile (*Table II*).—The point F represents the centre of gravity of the nasal and jaw regions combined, and as such is second in stability to the cranial region. The points CTF lie in a straight line, which may be used as a line or plane of reference more stable than any plane based upon anatomical points (*Figs.* 1, 2).

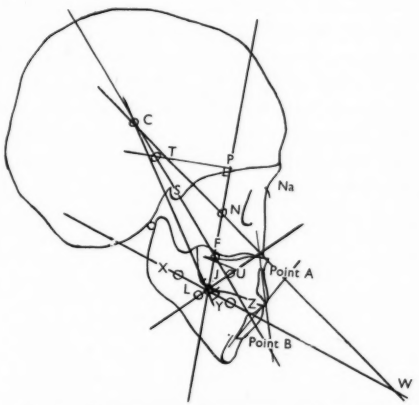

Fig. 1.—Diagram showing some points and planes in relation to centres of gravity.

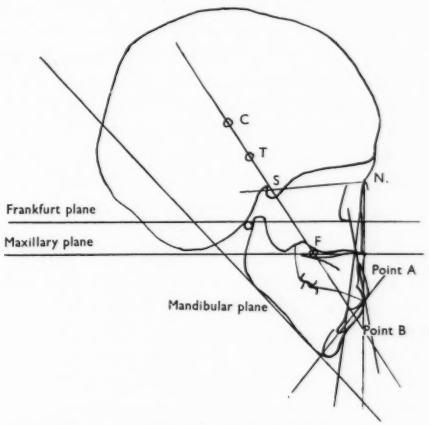

Fig. 2.—Diagram showing the plane CTF in relation to some conventional planes.

In a previous study of the profile of 210 Chinese children, an anteroposterior flattening was observed with a protrusion of the lower face. Variation was less marked. These figures would tend to confirm this observation.

Another indicator of profile is the distance TP, in which P is a projection of point T along a continuation of the line JN (*see Fig.* 1). The product moment correlation coefficient between the angle TFN and distance TP was 0·7. This distance TP is an approximate indicator of the anteroposterior relationship of the jaws in relation to the rest of the bony skull. The distance PJ is an indicator of the vertical relationship.

Table II.—Measurement of Profile

	English			Chinese		
	Mean	Standard Deviation	Standard Error	Mean	Standard Deviation	Standard Error
	Length in Cm.					
TF	7·2	0·28	0·06	7·2	0·25	0·05
NF	2·5‡	0·15	0·03	2·7‡	0·12	0·03
FJ	2·3	0·26	0·06	2·3	0·22	0·04
TP	5·0*	0·42*	0·08	4·7*	0·29*	0·06
PJ	7·5	0·59†	0·12	7·6	0·39†	0·08
	Angle in Degrees					
TFN	44·2*	4·0*	0·8	42·2*	3·1*	0·6

Statistical significance of difference: *=Probably significant; †=Significant; ‡=Highly significant.

The horizontal component TP was greater in the English group, indicating an average greater depth of face, or a lesser degree of prognathism. The vertical component PJ was similar in both groups, but variation was less in the Chinese both for the horizontal and for the vertical components.

The vertical measurements NF and FJ indicated a greater area in the jaw region in the Chinese children. This was because the point F was situated in closer relationship to the region of the greater area.

Table III.—Angles related to the Plane XY

	English			Chinese		
	Mean	Standard Deviation	Standard Error	Mean	Standard Deviation	Standard Error
	Length in Cm.					
XY	3·9†	0·30*	0·06	3·7†	0·18*	0·04
	Angle in Degrees					
TZX	29·2	3·8	0·77	30·2	4·0	0·80
TJX	39·0	3·5	0·70	40·4	3·6	0·73
CJX	36·7	3·3	0·65	37·6	3·9	0·78
NJX	73·0†	4·1	0·80	76·2†	4·5	0·90
CWJ	17·4	3·8	0·77	17·6	4·5	0·89
Axis A to XY	49·3	5·7	1·13	47·9	6·4	1·29
Axis B to XY	95·4‡	7·2	1·55	104·2‡	8·1	1·61

Statistical significance of difference: *=Probably significant; †=Significant; ‡=Highly significant.

The Line XY.—If the centre of gravity is found in an irregularly shaped body in which the overall length is greater than its width, a useful law presents itself. If the area is divided into two parts through the minimum width, the centres of gravity of these two separate parts connect to form a line very roughly at right angles to the dividing line. But, in fact,

this line is less subject to variation than is the original dividing line, and can be used as a line of reference (*see Fig.* 1).

This phenomenon can be utilized in producing a line of reference through the jaws, as their overall length is greater than the overall width. For the dividing line, one of the following may be chosen:—

1. A continuation of line NJ.
2. The minimum superior–inferior distance which passes through the centre of gravity J.
3. A line at right-angles to the mandibular plane, passing through the centre of gravity J.

All these lines are subject to variation. The continuation of line NJ was used, as it is a function of previous measurements. The line or plane of reference from the separate anterior and posterior halves was called the line XY.

Table IV.—THE LINE UL

	English			Chinese		
	Mean	Standard Deviation	Standard Error	Mean	Standard Deviation	Standard Error
	Angle in Degrees					
CJU	87·1	6·5	1·30	85·6	5·8	1·16
TJU	84·8	6·6	1·30	83·3	5·8	1·15
NJU	50·9	6·3*	1·25	51·0	4·4*	0·88
TVU	94·9	6·6	1·32	93·4	5·9	1·18
UJX	124·3	7·0	1·40	123·6	5·7	1·16
	Length in Cm.					
UL	2·5	0·22	0·04	2·5	0·18	0·104

Statistical significance of difference: *= Probably significant.

Table V.—THE ANGLE TVU

Skeletal Class	Mean	
	English	Chinese
II	100·1	97·7
I	94·1	93·3
III	86·0	85·3

The angle NJX was found to have a standard deviation of 4·1° in the English children. Statistically, it is calculated that in 99·7 per cent of the English in this age group, the angle NJX is likely to vary between 60° and 86°. This uncertainty of 26° was tested upon some of the English children, and was found to manifest itself in a variation of only 9° in the plane XY (*Table III*).

The line CTF may be considered as analogous to the line XY, though in this case the dividing line between the cranial region and the face and jaw region is irregular. But it does divide the two regions across a relatively narrow width, and this would add to the stability of the line CTF.

Rotation of the Jaws.—A number of different angles measure the degree of rotation of the jaws. The angle TZX is a measure of rotation of the plane XY to the stable plane CTF. As such, it relates the plane XY to the remainder of the skull. The angle TJX is similar, while the angle CJX relates the plane XY to the cranium. Rotation in relation to the cranium and face regions as separate components can be measured from the angle CWJ, while rotation to the face region alone is measured from the angle NJX.

Finally, the axes of the upper (axis A) and the lower central incisor teeth (axis B) were related to the plane XY.

These figures lead to interesting conclusions, for in each case there is a slight increase in the Chinese mean, except for that related to the axes of the upper central incisors. The tendency is for the Chinese jaws to be rotated slightly backwards. But in a previous study of 210 Chinese and 204 English children, the Chinese Frankfurt-mandibular angle averaged 36°, and the English averaged 27°, suggesting

a marked *forward* rotation of the Chinese lower jaw.

The significant difference in length XY indicated a greater overall length of the English jaws, and greater variation. But it has already been noted that the jaws present a greater projected area in the Chinese. Therefore, the Chinese present a greatly increased depth, which is entirely in the anterior region. The lack of depth in the posterior region gives rise to the very steep mandibular angle without causing any forward rotation of the jaws. In fact, it has been observed that there is a slight backward rotation, though this may be a reflection of the greater angle NJX upon the XY plane.

Confirmation of the steep mandibular plane in the Chinese group is given in the increased angle of axis B to XY, where in the previous study it was noted that the angle of the lower central incisors to the mandibular plane averaged 90° in both ethnic groups.

Skeletal Relationship of the Jaws.—If the separate centres of gravity of the 2 jaws are connected through point J, the resulting line UL can be utilized to study the skeletal relationship of one jaw to the other (*see Fig.* 1). Should one jaw lie in an anterior or posterior position to its opponent, both the skeletal relationship and the line UL are altered. This line was referred to neighbouring planes, and the figures given in *Table IV* obtained.

The angle NJU presented a greater degree of variation in the English, probably due to the greater variation in facial profile in this group. The closest correlation to the assessment of skeletal relationship by conventional methods was found in the angle TVU, that is, in relationship to the basic plane CTF (*Table V*).

Points A and B were plotted in positions corresponding to the maximum concavities opposite the apices of the upper and lower central incisor teeth. The distances from the centre of gravity J were measured, and also the distances from the centres U and L. A final measurement was made from the point J along the plane XY to the anterior borders of

Table VI.—Measurements within the Jaws

	English			Chinese		
	Mean	Standard Deviation	Standard Error	Mean	Standard Deviation	Standard Error
	Length in Cm.					
JA	3·7†	0·28	0·06	3·5†	0·21	0·03
JB	3·6*	0·18	0·04	3·5*	0·19	0·04
UA	2·0	0·17	0·03	2·0	0·16	0·03
LB	3·8	0·30	0·06	3·7	0·20	0·04
$J^{6/6}$	0·8	0·23	0·05	0·9	0·26	0·05
$J_{6/6}$	1·1	0·34	0·07	1·0	0·30	0·06

Statistical significance of difference: *=Probably significant; †=Significant.

Table VII.—Length JA : Length JB

Skeletal Class	Mean	
	English	Chinese
II	1·09	1·11
I	0·99	1·00
III	0·93	0·92
Total	1·01	1·02
Standard deviation	0·07	0·07
Standard error	0·014	0·015

Table VIII.—JA/JB × Angle TVU

Skeletal Class	Mean		Total Range
	English	Chinese	
II	109·1	110·8	103–128
I	92·8	93·5	86–102
III	79·7	79·0	76–84
Total	96·4	95·8	
Standard deviation	10·5	11·5	
Standard error	2·1	2·3	

the upper and lower first molar teeth (*Table VI*).

By calculating the ratio JA/JB, a further figure was obtained, which correlated with the skeletal classification (*Table VII*).

However, both the figures in *Table VII* and those found for the angle TVU (*Table V*) are statistical averages, and there was a certain amount of overlap between individual members of each group. But the accuracy was found to be greatly increased by multiplying the angle TVU by the ratio JA/JB (*Table VIII*).

This multiplication removed overlap in those cases examined, and the results were little altered by ethnic group, a steep angle of mandibular plane, or other morphological variations.

Similar though slightly less accurate results were calculated by subtracting 30 from the angle UJX, and multiplying this figure by the ratio JA/JB.

The Sella Turcica and Nasion.—The distance was measured from the total centre of gravity T to the 2 anatomical points, the centre of the sella turcica and to the nasion (*see Figs.* 1, 2). In the 2 ethnic groups there were certain differences both in distance and in variation (*Table IX*).

Table IX.—THE SELLA TURCICA AND NASION

	ENGLISH			CHINESE		
	Mean	Standard Deviation	Standard Error	Mean	Standard Deviation	Standard Error
	Length in Cm.					
TS	2·7*	0·48*	0·10	2·4*	0·27*	0·05
TNa	8·1†	0·42	0·08	7·7†	0·35	0·07

Statistical significance of difference: *=Significant; †=Highly significant.

The inference is that the total centre of gravity is less subject to variation than are either of these anatomical points. It is hoped that this will be confirmed by futures tudies.

SUMMARY

A preliminary study in cephalometrics, based upon centres of gravity used as mathematical fixed points, has indicated certain advantages over the similar use of anatomical points.

The combinations and permutations of distances and angles related to the centres of gravity are numerous, but certain of these are positive indicators in the assessment of facial profile, the relationship of the jaws to the skull, and the skeletal relationship of the jaws to one another.

Acknowledgement.—The writer wishes to express his thanks to Air Vice Marshal R. Scoggins, C.B.E., L.D.S., Q.H.D.S., for permission to publish this article.

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EDITORIAL [*continued from p.* 99]

routine practice organization under guidance is something which could bring great benefit to every young graduate.

Every year some 600 newly-qualified dentists entering the School Dental Service would mean an added strength to the service. Some might well remain to increase the permanent staff as well as create a younger professional age.

This, then, is the solution which THE DENTAL PRACTITIONER feels is one that could materially assist in improving the dental services to the youth of our country. It is up to the profession to act now if this opportunity is to be taken.

FIBROMA OF THE MANDIBLE

By IAN H. HESLOP, M.B., B.S., B.D.S., F.D.S.
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DURING the past fifteen or twenty years much light has been shed on the subject of fibro-osseous enlargements of the jaws, and many examples of this type of pathology, which were previously grouped together under one heading, have been separated into distinct entities. There is, however, still not universal agreement upon the nature of some of these enlargements and one still finds that the same name may be applied to different conditions by different people.

The fibro-osseous enlargement known as central fibroma of the mandible probably originates from relatively undifferentiated mesenchymal cells either within the bone or just beneath the periosteum, these cells being potentially osteogenic. Stones (1954) suggests that if these cells are adjacent to, or are part of, a tooth follicle the result of their proliferation may be a fibrous odontome; if they are cells of the perineural sheath a neurofibroma may be the outcome, such a case being described by Wilkinson and Pollak (1944). If the cells are the mesenchymal precursors of the osteoblast the result will be an ossifying fibroma.

Geschicter and Copeland (1936) believe that the so-called central fibroma is not in fact central but subperiosteal in origin, and appears to be central because subperiosteal new bone is laid down at the margins of the tumour, giving a clear radiographic outline and the appearance of a radiolucent or relatively radiolucent mass within the bone. They say, "because cortical bone is produced at the margins and because the pre-osteoid nature of the connective tissue beneath is not generally recognized, they have been classified as central fibroma". They regard this lesion as an ossifying fibroma, and Cooke (1957) appears to share this view and also states that the condition is subperiosteal rather than central.

Champion, Moule, and Wilkinson (1949) record details of an enormous tumour under the title of endosteal fibroma of the mandible, but there seems to be no reason to suppose that this could not have commenced as a subperiosteal lesion in the manner suggested by Geschicter and Copeland, rather than within the bone. It may be that Champion, Moule, and Wilkinson chose the title "endosteal" rather than "central" to cover any possible site of origin of the tumour deep to the periosteum, whether it was central or peripheral.

All views as to the precise site of origin of ossifying fibroma of the mandible must remain merely theory or clinical impression until such time as a sufficient number of cases in the very early stage are collected. Since the tumour is always symptomless until its size makes its presence apparent, unless it causes pain by pressure on the inferior dental nerve a statistically significant number of early cases may never be gathered together.

It seems reasonable to suppose that ossifying fibroma of the mandible is a condition which may arise centrally or peripherally and that those which arise within the bone will present eventually on one or both surfaces as an expansion. If such an expansion continues for a considerable time before the condition is first seen, the impression may be given that the lesion has started peripherally and worked inwards, by causing pressure resorption of the bone, and not centrally growing outwards.

Central fibroma and ossifying fibroma are probably not distinct entities but merely variations in the way in which (ossifying) fibromata of the mandible may occur. The site of origin decides whether the lesion is central or peripheral, but the histopathology is common to both. The degree of ossification or calcification varies according to the degree of differentiation of the cells concerned, the more highly differentiated producing recognizable bone, the least highly differentiated remaining as fibrous tissue only.

In our attempts to classify fibro-osseous enlargements of the jaws, care must be taken not to be excessive in our subdivision of types of pathology. It is suggested that the broad

heading covering central and subperiosteal fibromata, ossifying or not, should be simply "fibroma of the mandible", the terms "central" and "peripheral" being used only as descriptive clinical expressions indicating the *apparent* site of origin of a particular case, the terms "calcifying" or "ossifying" being used merely as adjuncts to the histopathological description of fibroma of the jaws.

Fig. 1.—Intra-oral radiograph showing the radiolucent area with trabeculation within.

Fig. 2.—Occlusal radiograph showing expansion of both buccal and lingual plates of bone.

Fig. 3.—Intra-oral radiograph six months post-operatively.

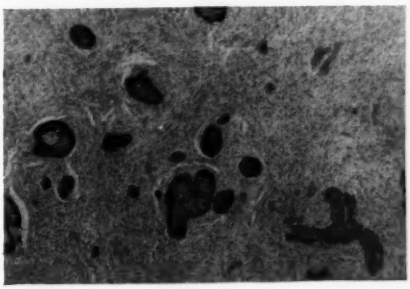

Fig. 4.—Section of the fibroma showing fibrous stroma, calcified material, and islands of bone. (× 33.)

The case reported below does in fact *appear* to have arisen centrally, as it presented on both surfaces of the mandible. It is suggested that had this tumour, which is not large, arisen beneath the periosteum, it would not have passed between and separated the teeth, nor would it have presented on the opposite surface of the mandible without destroying much more of the jaw than it did.

CASE REPORT

The patient, a girl of 16 years of age, was referred by her dental surgeon for treatment of what was thought to be a cyst in $\overline{43|}$ area. The condition had caused no symptoms and the patient was unaware that she had an enlargement of the jaw on the right side.

EXAMINATION.—

Extra-orally.—There was a slight swelling below and behind the angle of the mouth on the right side. The overlying skin was normal in colour and consistency and was not attached to the swelling, which on palpation was found to be hard and not tender. There was no anæsthesia of the lip.

Intra-orally.—$\frac{7\ 54321/1234567}{7654321/1234567}$ were present. In $\overline{5\text{–}2|}$ area there was a smooth hemispherical swelling having the appearance of a dental cyst. The overlying mucosa was normal in colour, but palpation showed the mass to be bony hard and without any suggestion of the fluctuation one would have expected in a cyst of comparable size. There was some divergence of the long axes of $\overline{4|}$ and $\overline{3|}$ without separation of the crowns.

Radiographic Appearance.—The intra-oral film, *Fig.* 1, showed the presence of a radiolucent area between $\overline{4|}$ and $\overline{3|}$, whose roots were divergent to a marked degree. There was a quite distinct outline to the abnormal area but fine trabeculation was visible within. The occlusal film, *Fig.* 2, showed this trabeculation rather better and showed the marked expansion of the buccal plate of bone and also slight expansion of the lingual plate.

The condition was thought to be a (central ossifying) fibroma or possibly an osteoclastoma, but it lacked the "soap bubble" appearance of the latter.

TREATMENT.—Under endotracheal anæsthesia a buccal mucoperiosteal flap was reflected in the $\overline{5\text{–}2}|$ area. A thin shell of bone was peeled from the surface of the tumour with a chisel. The exposure thus created was enlarged with bone nibblers and the mass was then easily elevated from its bed in one piece. The $\overline{4}|$ was extracted.

The bony cavity remaining was slightly undulating but smooth and without any evidence of invasion by prolongations of the tumour. The wound was closed with interrupted sutures.

PROGRESS.—This was without incident, the wound healed well and radiographs taken six months later showed evidence of bone regeneration within the cavity (*Fig.* 3).

HISTOPATHOLOGY.—The specimen consisted of young cellular fibrous connective tissue arranged in bundles typical of a fibroma. Within this tissue were many islands of calcified tissue and a small amount of bundle bone. This was a central ossifying fibroma (*Fig.* 4).

This example of fibroma of the jaws appears to have arisen "centrally" and contains areas of calcification and ossification.

Acknowledgement.—I should like to thank Mr. P. Turner, Turner Dental School, Manchester, for the microsection and the histopathological report.

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CLASP STABILIZER FOR REMOVABLE APPLIANCES

By **JOSEPH ANGELMAN**, H.D.D. R.C.S., L.D.S. (U. L'pool)

ONE of the essentials of removable-appliance techniques is the rigidity and stability of the appliance during the period of its use.

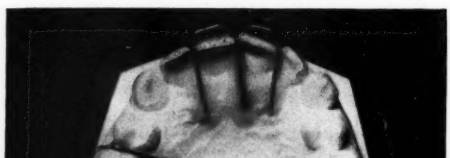

Fig. 1.—Shows three types of double arrowhead clasps with the stabilizer passing interdentally and lying in the interdental arrowhead.

The regular removal and replacement between adjustments alters the tension of the clasping whatever type of retention is used. In addition there is the loosening effect of normal use, and the habit in which some patients indulge, of displacing and repositioning the appliance with the tongue, lips, and teeth, more likely to occur when the appliance is loose.

Fig. 2.—Shows a labial and buccal view.

These factors interfere with the proper functioning of the appliance, and all too often result in fracture of one or more clasps. These can be repaired by soldering when the fracture is not too near the acrylic plate, but the repair always constitutes a weak spot. Where soldering cannot be carried out new clasps have to be fitted.

The following is a simple method whereby appliance stability is increased and clasp fracture considerably reduced. Where adjacent teeth can be used for retention by continuous cribbing or Adams double arrowhead cribs, a stabilizer is incorporated passing over the interdental fissure to embrace the buccal or labial aspect of the clasp, lying snugly in its interdental curve or arrowhead. This is constructed in 0·9-mm. hard stainless steel wire, and forms a rigid buttress which prevents bending of the clasp during use.

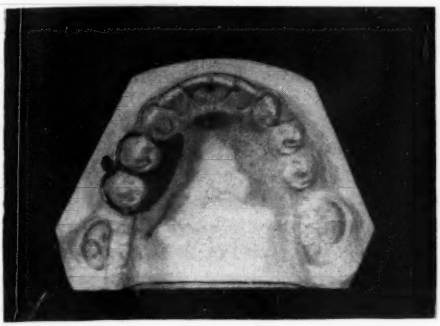

Fig. 3.—A continuous clasp on $\overline{|45}$ with the stabilizer fitting into the interdental curve bucally.

Tests were carried out in a series of 250 cases in which were compared (*a*) Similar appliances with and without the stabilizer; (*b*) Appliances with the stabilizer fitted on one side only. These tests demonstrated the increased stability and function of the appliances fitted with the stabilizer, and reduction of clasp fracture by 85 per cent.

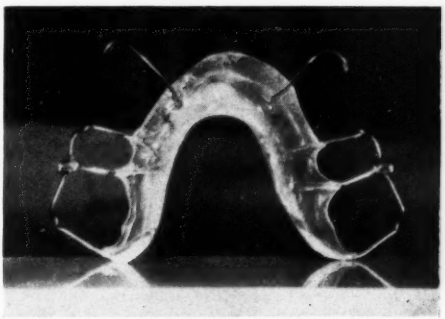

Fig. 4.—The fitting surface of an appliance with double clasping and stabilizers.

REFERENCES

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BOOK REVIEWS

PARTIAL DENTURES. By MERRILL G. SWENSON, D.D.S., F.I.C.D., F.A.D.P., Professor of Dentistry, Department of Prosthetic Dentistry, University of Oregon Dental School, and LOUIS G. TERKLA, D.M.D., Associate Professor of Dentistry, Department of Operative Dentistry, University of Oregon Dental School. Second edition. $9\frac{3}{4} \times 6\frac{3}{4}$ in. Pp. 389 with 403 illustrations, 6 in colour. 1959. St. Louis: The C. V. Mosby Co. (London: Henry Kimpton.) 78s. 6d.

IN the preface to the first edition of this book the authors tell us that it is presented as a tangible plan for teaching the construction of a partial denture utilizing a one-piece casting. The second edition has the same object, but has been revised and rearranged.

The book is in two parts: the first called "Related Factors and Fundamentals of Partial Denture Construction"; the second part "Construction of Partial Dentures". In Part I, diagnosis and treatment planning are first dealt with. The chart on Patient Survey for a partial denture is certainly exhaustive and one wonders whether such a chart would ever be completed.

The items listed on the chart are discussed in some detail and are followed by three pages in small print headed "Information and Instruction for the Partial Denture Patient". This is in the nature of an explanation to the patient of why the "rehabilitation" should be undertaken, and is couched in suitable non-technical terms. For example, "You will not be able to chew taffy with much success

because the denture is removable, and if you can lift it out with your finger, taffy can do the same thing".

Progressing to Chapter 2 we find that the authors have decided that although Kennedy's Classification is "logical and reasonable" they suggest substituting Class I for Class II. In addition the "modifications" of Kennedy are now labelled A or P according to the position of the extra saddle. This becomes extremely confusing, particularly when in Fig. 14 a Kennedy Class III, div. 1 case is labelled as Class IV P!

Whilst the Kennedy Classification may be criticized, it is at least universally used and understood. The introduction of a further classification seems quite unnecessary.

The succeeding chapters in the first half deal with "planning, designing and surveying", tooth preparation for clasping, and designs for various classes of partial dentures. With minor exceptions all of the designs illustrated are good and practical; moreover there is a description of each design and the reasons are given for the choice and placing of each component. This chapter should prove valuable to the student.

The penultimate chapter of the first half deals with bite analysis, which in this case is entitled "The Correction of Interceptive Occlusal Contacts in Centric Relation of Natural Teeth".

The procedure is well described and illustrated.

Concluding the first half are some comments on miscellaneous factors related to partial dentures. These include some remarks on nutrition, chrome and gold alloys, and a short discussion on stress distribution.

The second half of the book deals with operative and mechanical techniques. After detailed description in Part I it seems hardly necessary to describe the use of the face bow again, although some difference is seen in that Fig. 178 is repeated (Fig. 328) but this time reversed—presumably to afford some variety!

The stages in the construction of partial dentures are described in considerable detail—in fact the criticism could be made that too little knowledge is assumed and that there is too much repetition of processes described in the first half of the book.

However, the authors say that this is intended "in order to avoid digressions which would detract from the sequence of study". There is also a chapter on cleft palate and partial dentures, which although brief does describe one method of impression-taking for this deformity—something which few books on the subject attempt. Finally there is a good list of references and a glossary based on that compiled by the Academy of Denture Prosthetics in the U.S.A. The illustrations in the book are very good indeed, although it seems unnecessary to include the photographs of a denture being finished.

There are 389 pages and the cost is 78s. 6d. One cannot help feeling that the same information could well be contained in a smaller book with a consequent reduction in cost.

A. O. M.

THE DENTITION OF THE GROWING CHILD. A Longitudinal Study of Dental Development between 3 and 18 Years of Age. By COENRAAD F. A. MOORREES, Chief of the Orthodontic Department, Forsyth Dental Infirmary for Children, and Research Fellow in Odontology at the Peabody Museum, Harvard University. $9\frac{1}{4} \times 6$ in. Pp. 245+x, with 68 illustrations and many tables. 1959. Cambridge, Mass.: Harvard University Press. (London: Oxford University Press.) 45s.

HAVING had the privilege of reviewing Dr. Moorrees's recent book on the *Aleut Dentition*, it is not surprising to find that this later work is of a very high standard and a most important contribution to the pedodontic and orthodontic literature. This longitudinal study of 184 children of European stock and of almost equal sex distribution records their dental development over 12–15 years. While the assessment of a physiological process by the measurement of so-called fixed points in a tissue as plastic as bone is always open to criticism, Dr. Moorrees has again shown us that much valuable information can be gained in this way. The author makes no attempt to review the literature on growth as a whole,

but confines himself to a comprehensive review of the literature on the study of growth by measurement. This book ably demonstrates the wide range of normality and then discusses the problem of assessing the occlusal prognosis. The findings are based on measurements from serial models. The author selects 9 individuals, and presents a detailed description of their individual dental developments. These cases were selected as a basis for the study of group developmental patterns and range over such conditions as incisor crowding; large mandibular teeth in an arch of less than average length and no more than average breadth; absence of interdental spacing in the maxillary arch with crowding of the mandibular teeth; a maxillary deciduous dentition with marked spacing; and a narrow dental arch in the deciduous maxillary dentition with marked increase in the intercanine distance after 5 years of age. The final section discusses the assessment of the orthodontic prognosis and also mentions the problem of space maintenance. While Dr. Moorrees gives little encouragement to either the protagonists or antagonists of artificial space maintainers, the book as a whole is one that all who have a practical interest in children's dentistry or orthodontics will want to read.

T. G. H. D.

ANATOMY FOR STUDENTS OF DENTISTRY. By JAMES HENDERSON SCOTT, D.Sc., M.D., L.D.S., Reader in Anatomy for Dental Students, The Queen's University, Belfast, and ANDREW DERART DIXON, M.D.S., B.Sc., Ph.D., Lecturer in Anatomy for Dental Students, University of Manchester, Visiting Professor of Anatomy, State University of Iowa. $8\frac{5}{8} \times 5\frac{5}{8}$ in. Pp. 484+xi, with 288 illustrations. 1959. Edinburgh and London: E. & S. Livingstone Ltd. 55s.

MUCH thought and care have gone to the plan of approach and presentation. A general account of the systems of the body runs on into a simple account (in places perhaps too simple) of topographical anatomy in the thorax and abdomen, followed by a similar account of the head and neck. A more detailed account of the oral cavity and face follows, and then come 40 pages of embryology. The next 80 pages comprise a chapter entitled "Detailed Systematic Anatomy", nearly 60 pages of which are devoted to a description of the skull bones and their development and growth. The nervous system, central, peripheral, and autonomic, is then dealt with in a chapter of nearly 60 pages. A short chapter on clinical anatomy completes the work.

The authors state that the "ABC of anatomy is accuracy, brevity and clarity". On the good foundations of the above general plan they have composed a text that is not always accurate, hardly brief (the book has 452 pages), and often by no means clear. Far too often the reader is left in doubt as to the exact position of a structure, being told it is "related to" or "closely related to" something else, *without being told in what way*. This is bad descriptive prose, and becomes very tiring—"is related to" occurs repeatedly throughout the book, sometimes half a dozen times on one page. When the compositor joins in, the result can be appalling, as on p. 336, "Meckel's cartilage, the pterygo-quadrate bar, and the hyoid arch are cartilaginous structures developing in close relationship with the chondro-cartilaginous structures developing in close relationship with the chondrocranium". Deletion of the compositor's repetition improves but fails to perfect this typical example of the authors' style.

Over 280 half-tone photographs and line drawings illustrate the book. Most of them are very effective. The captions of Figs. 249 and 250 are transposed, and Fig. 220 is wrongly labelled. It would be of great help to be given the page number when, as often happens, a distant figure is referred to in the text.

The index is a full one. As there is so much repetitive description throughout the book (no bad thing in itself) some index entries are followed by many page numbers (the glossopharyngeal nerve has 14 page references). In such cases it would be convenient to have the chief reference in heavy type.

The volume is on heavy art paper, is very well printed (there are pleasingly few printer's errors), and is very strongly bound.

R. J. L.

HYPNOSIS IN GENERAL DENTAL PRACTICE. By THOMAS W. FROST, L.D.S. $8\frac{1}{2} \times 5\frac{1}{4}$ in. Pp. 128, with 34 illustrations. 1959. London: Henry Kimpton. 21s.

As the publishers point out, this is the first book written in this country which is devoted exclusively to the use of hypnotic techniques in dentistry. The author is to be congratulated on the simplicity and clarity of his language. In this respect it contrasts strongly with most books on hypnosis published in other countries, and sometimes even intended for the unfortunate layman!

One is glad to see the author does not overemphasize the use of hypnosis as an anæsthetic agent. Although on some occasions it is the anæsthetic of choice, most practitioners who use it will probably agree that its main value is in the elimination of fear of dental treatment and to assist other anæsthetics. As the author says, amnesia can frequently be suggested in even a light stage of trance and it is surprising how patients whose reactions on occasion under treatment suggest a lack of success seem to have no recollection afterwards of discomfort or pain and no dread of future treatment. Mr. Frost regards instruction in hypnosis as essential to the undergraduate. Attempts to inculcate this idea into the minds of the heads of the dental schools have so far invariably been met with the reply that the curriculum is too crowded and that instruction must be done as a postgraduate study. This is a matter of opinion, but the writer agrees with Mr. Frost that some instruction, at least, ought to be given before qualification. Quite a number of newly-qualified practitioners still seem to have the idea that they are going to operate on machines and not human beings.

The stages of hypnosis are well and clearly described, and the author has avoided the modern tendency to multiply them unnecessarily and produce confusion in the reader's mind.

The techniques of induction are given in a thoroughly practical manner, but the author does not perhaps sufficiently emphasize there is no hard-and-fast rule about awakening signals. Some of us, for instance, reverse the counting technique to awaken the patient as being more logical.

There is a particularly interesting and well-written chapter on deepening hypnosis. This is the greatest problem facing the practitioner, and the beginner often gets disheartened without realizing that he is attempting the impossible, and that much can be achieved in even a light hypnotic trance.

The author, quite rightly, deprecates over-salesmanship of hypnosis, in fact, he discourages its use to satisfy the curiosity of the patient. It is interesting to note that he advises the beginner in induction to read from a script out of sight of the patient, a course which the present writer has also advocated.

The combination of hypnotic suggestion with general anæsthetics might have been stressed rather more as far too little use of this technique is made by anæsthetists.

The writer agrees with Mr. Frost that the future outlook of hypnosis in dentistry should be bright. This is particularly so if the dentist confines its use to analgesia and the removal of fear and avoids the obviously "psychiatric" patient. There is one important exception to this, and that is the use of hypnosis in the cure of "thumb-sucking" in children which has given excellent results but is not described by Mr. Frost.

In general medicine there is still disagreement between the psychiatrist and the general practitioner as to the capacity of the latter to assess the role of hypnosis in treatment, and this factor is tending to hamper its general acceptance.

The case histories are grouped together at the end of the volume, but the notes in the text make reference easy. They are objectively and well described.

This book can be thoroughly recommended as an indispensable aid to any dental practitioner taking up the study of hypnosis. Though inexpensive and easily read it contains all the essentials necessary for the beginner in hypnosis. Future editions could well include a fuller bibliography of books for additional study.

E. E. W.

ABSTRACTS FROM OTHER JOURNALS

Some Correlations between the Occlusal Pattern, Function, and Pathology of the Masticatory System

Eight hundred and sixty-five adults, of whom 327 were males and 538 females, with an average age of 35 years, had their occlusions analysed with regard to overbite, overjet, and free-way space. It was found that:—

1. A large free-way space accompanies a large overbite.

2. Neutrocclusion, including Angle Class I malocclusion, generally has a smaller free-way space than Class II and Class III malocclusions.

3. A large overjet generally has a large movement of the condyles when the mandible moves from the rest position to the protruded position.

4. Only slight connexion was found between a small overjet and cases which had no periodontal disease and no temporomandibular joint lesion.—POSSELT, U. (1959), *Parodontologie*, **13**, 3.

Histological Effects of Silver Nitrate on Human Dentine and Pulp

A review of the literature relating to topical application of silver nitrate to dentine reveals a considerable variation in opinion as to its effectiveness and its safety. This drug is in common use both to desensitize exposed dentine and to arrest deep dentine caries where its removal might otherwise cause pulpal exposure. Some workers claim that silver nitrate is self-limiting by virtue of being precipitated as insoluble silver by tissue fluids; others state that it reaches the pulp. Many published techniques are empirical and not based on scientific assays to determine their safety.

This investigation was therefore undertaken to assess histologically the effect of application of Howe's ammoniacal silver nitrate to carious dentine, sound dentine, and pulp tissue.

Sound teeth, carious teeth, and cariously exposed teeth were treated with silver nitrate, sometimes followed with eugenol, and these teeth were extracted at intervals varying from 5 minutes to 32 days. Thirty-six teeth were used in all.

Results and Conclusions.—

1. Ammoniacal silver nitrate was not self-limiting but penetrated primary and secondary tubular dentine and carious dentine.

2. Sound and carious dentine was stained differentially by silver nitrate.

3. When applied to carious or sound dentine considerable damage occurred to the pulp, including atrophy of the odontoblast layer and hæmorrhage and œdema within the pulp tissue.

4. Less damage occurred to the pulp tissue when silver nitrate was applied directly on to the exposed pulp tissue in carious exposures. Protection was thought to be afforded by the blood-clot.

5. In view of its potentially injurious action (and its limited sterilizing properties shown by previous workers) the value of topically applied silver nitrate is questioned.—ENGLANDER, HAROLD R., JAMES, VERDA E., and MASSLER, MAURY (1958), *J. Amer. dent. Ass.*, **57**, 621.

Preliminary Investigation of some Basic Problems of Instrument Sterilization

A rise in the incidence of serum hepatitis reported by a committee of the World Health Organization prompted a re-evaluation of sterilization methods for dental instruments. The various methods available are reviewed and it is pointed out that the appearance of autoclaves on the market at economical prices offers a more certain mode of sterilization than other techniques commonly employed. A disadvantage, however, appeared in the form of corrosion to some dental instruments. To overcome this, instruments were first immersed in an oil/water emulsion prior to autoclaving.

This technique was studied to determine two things: (1) Whether corrosion was prevented, and (2) whether sterilization was achieved.

Three types of emulsion were used, I.S.L. Emulsion, AC–10, and Emulsion A specially prepared for these experiments. The instruments were first inoculated with *B. globigii*, a spore-forming bacillus. They were then immersed in an emulsion and after draining were autoclaved in steam at 121° C. for 15 minutes. Cultures were then taken using sterile cotton-wool which was then implanted in nutrient broth. Incubation continued for 10 days and as a further check the broth was then plated out on nutrient agar.

Results.—

1. Corrosion can be reduced significantly or eliminated by this method.

2. The oil-film does not interfere with sterilization, which was quite satisfactory.—CROWLEY, MARY C., CHARBENEAU, G. T., and APONTE, ADATH J. (1959), *J. Amer. dent. Ass.*, **58**, 45.

The Acrylic Labial Arch

The construction and application of an acrylic labial arch based upon a heavy labial arch wire is described as a means of controlling the mandibular anchorage. With this appliance it is said that bands may be eliminated much sooner in extraction cases than in non-extraction cases, while still maintaining adequate anchorage. The force of the lower lip helps in preventing labial movement of the lower anterior teeth. The appliance can be used to help in reducing the deep overbite.—PERLOW, J. (1959), *Amer. J. Orthodont.*, **45**, 218.

A Study of the Topical Administration of Hydrocortisone Acetate, 9-alpha-Fluorohydrocortisone Acetate, and Pyridoxine Hydrochloride upon Oral Lesions

The literature on the topical administration of cortisone and pyridoxine in the treatment of oral lesions is reviewed. A number of cases in which the lesion was symmetrical were selected to test clinically the effectiveness of these substances. There were 7 cases of gingivitis; 1 of chronic atrophic senile mucositis; 6 of herpetic stomatitis; 2 of primary herpetic gingivostomatitis; 2 of periadenitis mucosa necrotica recurrens; 15 of lichen planus, 3 being erosive; 1 of a lichoid lesion; 2 of hyperkeratosis with inflammation; 3 of desquamative gingivitis; 1 of hormonal gingivitis; and 2 of migratory glossitis. Fourteen were treated with fluorohydrocortisone, 13 with hydrocortisone, and 15 with pyridoxine.

The patients were instructed to apply the ointment containing the medicament under trial to the lesion on one side of the mouth three times daily and a placebo ointment in the same manner on the opposite side.

Microscopically no difference was observed between the lesions treated by any of the drugs and those treated by the placebos.—FERRIGNO, P. D. (1958), *J. Periodont.*, **29**, 137.

LETTER TO THE EDITOR

December 17, 1959

Dear Sir,

Many will recall that the Centenary of the granting of the Charter, whereby the Licence in Dental Surgery Diploma was instituted, was celebrated in July at the Royal College of Surgeons.

A considerable number of Licentiates and Fellows have since expressed the wish that recognition could be given to mark this great occasion in the history of Dentistry. It is felt, therefore, that a suitable presentation to the Royal College of Surgeons would serve the dual purpose of expressing appreciation for the help given to the Profession in the past and, at the same time, preserve with dignity the memory of an historical event which is such a milestone in dental history. Accordingly, the undersigned, being the representatives of the Licentiates on the Board of Faculty of Dental Surgery, have resolved to establish a fund for this purpose and wish, through the medium of your JOURNAL, to stimulate as much interest in supporting this endeavour as was expressed by those attending the celebrations of the College in July.

We, therefore, appeal to all Licentiates and Fellows of the Royal College of Surgeons of England to send a donation for this purpose direct to R. J. G. Grewcock, Esq., L.D.S. R.C.S., of 40, Harley Street, London, W.1, so that we can, in due course, hand over to the College on behalf of the Licentiates a token of esteem and a memento worthy of this great event.

Yours faithfully,

RONALD J. G. GREWCOCK
W. CHRISTIE RAE
ALAN MACK.

(Representing the Licentiates in Dental Surgery on the Board of Faculty of Dental Surgery.)

Faculty of Dental Surgery,
Royal College of Surgeons of England,
Lincoln's Inn Fields,
London, W.C.2.

A CLASS III CASE WITH OVERCLOSURE
A CLINICAL AND CEPHALOMETRIC STUDY

By C. D. PARKER, B.Ch.D., F.D.S., D.Orth. R.C.S.
Institute of Dental Surgery, The University of London, Eastman Dental Hospital

INTRODUCTION

THE postural Class III type of occlusion was discussed by Ballard (1955), who considered there were two main factors in the production of this type of occlusion:—

1. A skeletal and soft tissue morphology which results in edge to edge contact in the labial segments in the normal path of closure.

2. A reflex mechanism which produces a habit movement of the mandible to avoid edge to edge contact in masticatory movements, swallowing, and speech. The normal pattern of muscular activity which determines the occlusal level is disturbed, there being muscular activity at the usual level of muscular relaxation (Ballard and Grewcock, 1954). This results in an occlusion being established at an overclosed position of the mandible.

The resulting excessive interocclusal clearance can usually be considered as having two components:—

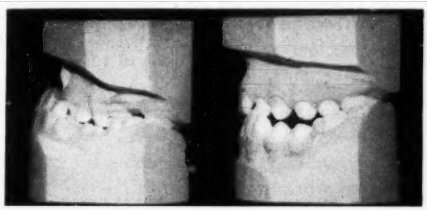
1. The normal amount of interocclusal clearance.

2. The amount of overclosure.

More recently Ballard (1959) has stated that he thinks this picture may be confused by the fact that the failure of labial segment occlusion allows excessive vertical development of the labial segments which encroach on the patient's rest position. This results in a habit posture which is open from rest. If this is so, then in certain cases there is a third component:—

3. The distance between the open habit posture and the true rest position of the mandible.

The treatment of these cases is centred on eliminating the mandibular displacement.



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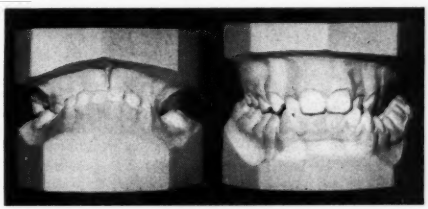

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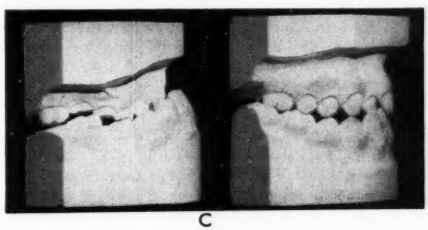

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Fig. 1.—Models before and after treatment.
A, Left view; B, Front view; C, Right view.

This is achieved by altering the abnormal incisal relations. Ballard (1955) has shown that when the abnormal incisor relationship is corrected the occlusal level is altered, with an opening of the maxillary–mandibular plane angle, and with a corresponding decrease in the excessive interocclusal clearance. Both these observations would support the view that the overclosure was the direct result of the mandibular displacing activity. In the cases with a habit posture one would expect after treatment that a new position would be established, the true rest position, closed from the habit posture.

Given at the Manchester meeting held on April 17, 1959.

CASE REPORT

On examination, on April 20, 1955, the patient, aged 8 yr. 10 mth., was found to have a Class III incisal relationship on a skeletal III dental base. The patient was able to bite edge to edge on $\underline{1|1}$ but then moved forward out of contact and into an overclosed

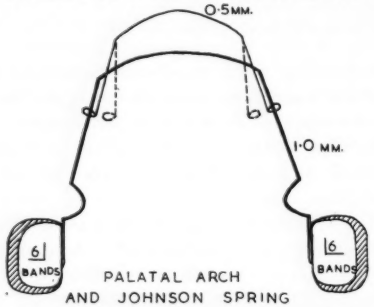

Fig. 2.—Fixed appliance.

occlusal position (*Fig.* 1). Associated with the overclosure was an excessive interocclusal clearance of 14 mm. in the incisor region and 11 mm. in the molar region.

Lateral skull radiographs with lead shot attached to the incisor and molar teeth were taken in three positions: (1) Habit posture 1.P. (2) Initial contact 1.I. (3) Occlusion 1.O.

Treatment.—From May 25, 1955, to March 8, 1956, an appliance was worn to procline $\underline{21|12}$ over the bite (*Fig.* 2). No bite opening device was used and no treatment was given to the lower arch. From March 8, 1956, to October 10, 1958, after the active treatment was completed a palatal arch was worn as a retainer.

At examination on November 3, 1958, the patient, aged 12 yr. 4 mth., now presented with $\underline{1|1}$ in Class I occlusion with $\underline{2|2}$ inside the bite (*Fig.* 1). The $\underline{1|1}$ were slightly mobile. The patient could bite edge to edge on $\underline{2|2}$, but the mandible assumed a slight downward and forward habit posture to avoid these teeth. This abnormal incisal relationship may not allow the complete elimination of the overclosure, besides being the cause of a mandibular habit posture instead of rest. The excessive interocclusal clearance was 4 mm. in the incisor region and 3 mm. between $\frac{4}{5}$. Again, as postulated in the pre-treatment condition, there may be three components, but the second and third, i.e., the amount of overclosure and the amount of open posture, are much reduced. Lateral skull radiographs with lead shot were taken: (1) Habit posture 4.P. (2) Occlusion 4.O.

CEPHALOMETRIC STUDY

An attempt will now be made to try to isolate the effects of treatment. The lateral skull radiographs were traced and two points of superimposition have been used, depending upon the information required.

1. Superimposing on sella (S) and sella–nasion line (S–N) for general facial changes.

2. Superimposing on anterior nasal spine (ANS) and maxillary plane (Mx) when changes occurring in the intermaxillary space, i.e., between the maxillary and mandibular planes (Mx–Md), were the subject of interest. In each case the superimposition point and plane will be indicated.

List of Lateral Skull Radiographs.—

1.P. Habit posture
1.I. Initial contact
1.O. Occlusion
} Before treatment (April 20, 1955).

2.O. End of active treatment Class III occlusion but could bite in Class I occlusion (March 8, 1956).

3.O. Occlusion during retention (January 30, 1957).

4.P. Habit posture
4.O. Occlusion
} After treatment (November 3, 1958), just out of retention.

Growth.—

The growth recorded in this case has two parts:—

1. Normal growth, which would have occurred without treatment.

2. Vertical development of the dento-alveolar structures, which has been responsible for eliminating the overclosure.

Table I.—Readings from Radiographs showing Habit Postures before and after Treatment

	1.P.	4.P.	Difference between 1.P. and 4.P.
N–ANS	55 mm.	59 mm.	+4 mm.
ANS–GN	67 mm.	69 mm.	+2 mm.
N–S–GN	67°	65°	−2°
S–N–GN	79°	83°	+4°
Mx–Md	27°	23°	−4°
SN–GOGN	34°	30°	−4°

The first could have been calculated from rest position lateral skull radiographs before and after treatment. Unfortunately in this case I believe that rest position was not recorded in either case, but habit postures were, and therefore using these lateral skull tracings any distance changes or changes in

angles would represent normal growth and change in habit posture (*Table I*).

The sum of (1) and (2), i.e., normal growth and vertical development, is readily obtained from the occlusal level radiographs before and after treatment (*Table II*).

1. *Normal Growth and Postural Changes* (*Fig.* 3).—4.P. on 1.P. superimposed on S and (S–N) line.

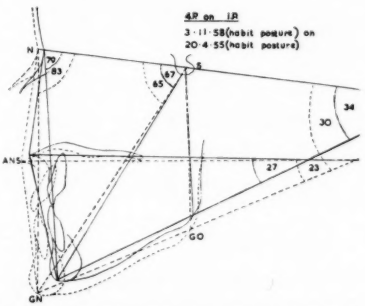

Fig. 3.—Superimposed radiograph tracings of habit postures before and after treatment, showing normal growth and change of habit posture.

Distance Changes.—From *Table I* it will be seen that while the N–ANS distance increased by 4 mm. the ANS–GN distance only increased by 2 mm. Growth studies in this age range have been carried out by Brodie (1953) and Meredith, Knott, and Hixon (1958). The latter workers calculated mean values and individual variation for the index.

$$\frac{\text{Nasal Height} \times 100}{\text{Subnasal Height}}$$ at various ages.

From calculations based on this work I would have expected an increase of 3–4 mm. in the ANS–GN distance.

Angular Changes.—In *Table I* the following angles decreased during the treatment period: N–S–GN by 2°, Mx–Md by 4°, and SN–GOGN by 4°. Brodie (1953) in his growth study found in one case only out of 19 a decrease in the N–S–GN angle. Although one cannot predict growth, the small increase in ANS–GN distance plus the decrease in N–S–GN angle along with a 4° decrease in the Mx–Md angle are to me suggestive of normal growth and change in habit posture rather than growth alone. The condylar and rotation axis changes which are mentioned later would also tend to bear this out.

2. *Normal Growth and Vertical Development of the Dento-alveolar Structures* (*Fig.* 4).—4.O. on 1.O. superimposed on S and (S–N) line.

Distance Changes.—From *Table II* it will be seen that while the N–ANS distance increased by 4 mm. the ANS–GN distance increased by

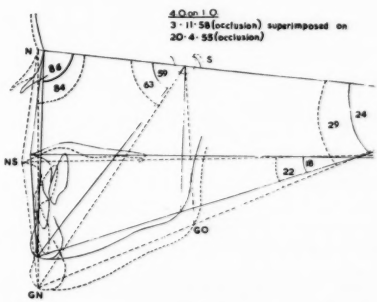

Fig. 4.—Superimposed radiograph tracing of occlusion before and after treatment, showing normal growth plus vertical development.

13 mm. The ANS–GN increase is far too great to be accounted for by normal growth (Meredith, Knott, and Hixon, 1958). I think the explanation lies in the elimination of the mandibular overclosure, although to this must be added normal growth. Working on mean figures it would appear that the overclosure was somewhere in the order of 10 mm. and normal growth around 3 mm., which gives

Table II.—Readings from Radiographs showing Occlusion before and after Treatment

	1.O.	4.O.	Difference between 1.O. and 4.O.
N–ANS	55 mm.	59 mm.	+ 4 mm.
ANS–GN	53 mm.	66 mm.	+13 mm.
N–S–GN	59°	63°	+ 4°
S–N–GN	86°	84°	− 2°
Mx–Md	18°	22°	+ 4°
SN–GOGN	24°	29°	+ 5°

us the 13 mm. total increase in ANS–GN distance.

Angular Changes.—A study of *Table II* shows the following angles increased during the treatment period: N–S–GN by 4°, Mx–Md by 4°, and SN–GOGN by 5°. There was a decrease of 2° in the S–N–GN angle. Brodie (1953) in his growth study never found a

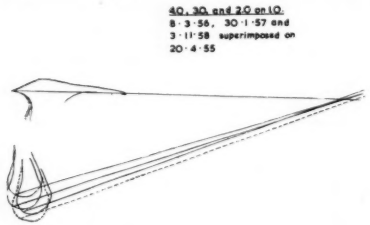

Fig. 5.—Superimposed radiograph tracing of occlusion before, during, and after treatment, showing progressive vertical development.

decrease in the S–N–GN angle. The large increase in the ANS–GN distance would suggest an additional factor to normal growth, which I believe is the elimination of an overclosure (Ballard, 1957).

The above changes, I think, represent normal growth and the vertical development of the dento-alveolar structures in the elimination of the overclosure, following treatment.

3. *Progressive Vertical Development* (*Fig.* 5).—1.O., 2.O., 3.O., and 4.O. superimposed on ANS and Mx.

Table III.—Further Readings from Radiographs showing Occlusion before, during, and after Treatment

	ANS–GN	Mx–Md	ULS–Mx	LLS–Md
1.O.	53 mm.	18°	106°	75°
2.O.	59 mm.	20°	117°	72°
3.O.	63 mm.	22°	117°	74°
4.O.	66 mm.	22°	118°	74°

The figures in *Table III* show that there has been a progressive increase in the size of the intermaxillary space with an opening of the Mx–Md angle. During the period of active treatment the upper labial segment was proclined 11° in order to move the teeth over the bite. Since then there has been virtually no change of axial inclination. The lower labial segment inclination is also virtually unchanged after treatment.

4. *Initial Contact and Final Occlusal Level* (*Fig.* 6).—4.O. on 1.I. superimposed on S and (S–N) line.

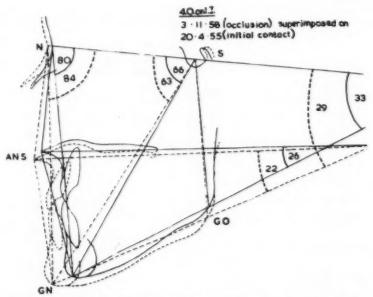

Fig. 6.—Superimposed radiograph tracings of initial contact before treatment and occlusion after treatment, showing possible overclosure or excessive vertical labial development.

In *Table IV* it will be seen that the ANS–GN distance is unchanged when comparing the initial contact before treatment and the occlusal level after treatment. By way of

Table IV.—Readings from Radiographs showing Initial Contact before Treatment and Occlusion after Treatment

	1.I.	4.O.	Difference between 1.I. and 4.P.
N–ANS	55 mm.	59 mm.	+4 mm.
ANS–GN	66 mm.	66 mm.	0 mm.

explanation, I feel two factors should be considered:—

a. Possible slight overclosure still present.

b. Possible excessive vertical development of the labial dento-alveolar structures before treatment.

It may well be that both factors are involved to some degree.

5. *Changes in the Interocclusal Clearance.*—This analysis is based on the technique described by Nevakari (1956).

a. Before Treatment (*Fig.* 7 A).—
Incisor interocclusal clearance=14 mm.
Molar interocclusal clearance =11 mm.

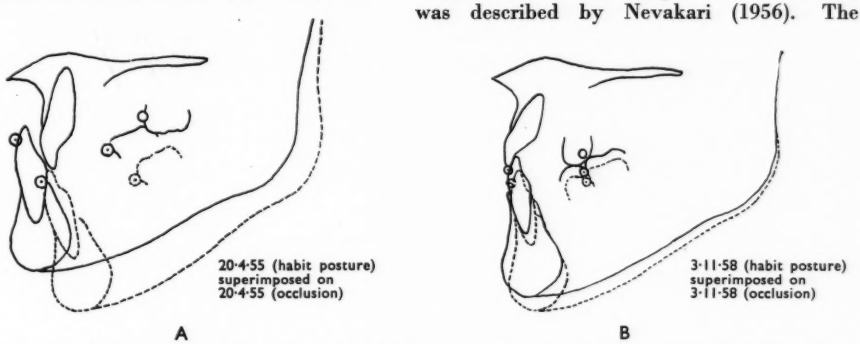

Fig. 7.—Superimposed radiograph tracings of habit posture and occlusion showing excessive interocclusal clearance. A, Before treatment; B, After treatment.

b. After Treatment (*Fig.* 7 B).—
Incisor interocclusal clearance=4 mm.
Molar interocclusal clearance =3 mm.
Reduction in Interocclusal Clearance.—
Incisor region=14 mm.–4 mm.=10 mm.
Molar region =11 mm.–3 mm.=8 mm.

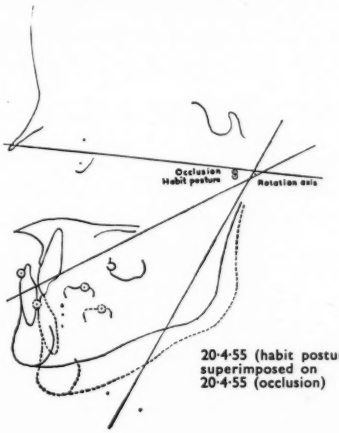

Fig. 8.—Superimposed radiograph tracing of habit posture and occlusion before treatment, showing mandibular rotation axis and condylar movement.

6. *Rotation Axis from Habit Posture to Occlusion.*—The sum of all movements from rest or a habit posture to occlusion can be expressed in terms of a geometric rotation axis. This, however, does not mean that the mandible rotates on a hinge axis. The method was described by Nevakari (1956). The rotation axis is the intersection of the perpendicular bisectors of the lines joining the centres of the lead shot at habit posture and occlusion.

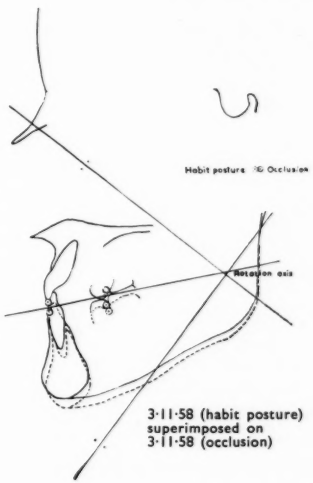

Fig. 9.—Superimposed radiograph tracing of habit posture and occlusion after treatment, showing mandibular rotation axis and condylar movement.

a. Rotation Axis, Before Treatment (*Fig.* 8).—This was located just behind the head of the condyle.

b. Rotation Axis, After Treatment (*Fig.* 9).—This was found to be in the middle of the ramus.

A change of rotation axis suggests that the four positions of the mandible recorded (two before and two after treatment) cannot all be in centric jaw relationship. It is impossible to say which or how many of the four positions are not centric jaw relations.

7. *Condylar Movements from Habit Posture to Occlusion.—*

a. Before Treatment (*Fig.* 8).—1 mm. upward movement of the condyle from habit posture to occlusion.

b. After Treatment (*Fig.* 9).—2 mm. backward and slightly downward movement of the condyle from habit posture to occlusion.

Both these condylar movements would be in accord with a habit posture instead of true rest position. Before treatment an open habit posture and after treatment a slightly forward and open posture.

SUMMARY

Following a change in incisal relations from Class III to Class I by proclining the upper labial segment:—

1. The interocclusal clearance decreased by 10 mm. in the incisor region and 8 mm. in the molar region. Before treatment the excessive interocclusal clearance was considered to have three components which have been termed: (*a*) Normal, (*b*) Overclosed, and (*c*) Open posture. Treatment was thought to considerably reduce if not completely eliminate the overclosure and at the same time was responsible for a change in the open posture.

2. The distance between anterior nasal spine (ANS) and gnathion (GN) with the teeth in occlusion has increased by 13 mm. This has been progressive with an increase in the maxillary–mandibular plane angle (Mx–Md) from 18° to 22°.

Two factors are involved:—

a. The normal growth process has contributed at least 2 mm.

b. Vertical development of the dento-alveolar structures due to a new level of balance for masticatory muscle pressure and the inherent tendency of dento-alveolar vertical development. This was responsible for approximately 10 mm. The vertical development opened the Mx–Md plane angle.

Therefore, the part played by vertical development of the dento-alveolar structures following the change in incisal relations is largely responsible for the reduction if not complete elimination of the overclosure.

3. The ANS–GN distance is the same in the initial contact level before treatment and the occlusal level after treatment. Two factors should be considered:—

a. Possible vertical development to occur and overclosure to be eliminated, or

b. Possible excessive vertical development of the labial segments before treatment, there being no overclosure now present.

4. A change in the rotation axis before and after treatment is significant. This suggests that the habit postures and occlusal positions recorded before and after treatment cannot all be in centric jaw relationship.

5. Changes in the degree and direction of condylar movement. Before treatment 1 mm. upward movement from habit posture to occlusion as compared to 2 mm. backward and slightly downward movement after treatment. Both these would suggest habit postures were assumed by the mandible before and after treatment.

Acknowledgements.—I am very grateful to the radiographic and photographic departments of the Eastman Dental Hospital and to Miss S. B. Magarshack for preparing the illustrations. I would like to thank Mr. J. R. E. Mills for his help and Professor C. F. Ballard for advice and criticism and for permission to publish this case, which was treated at the Eastman Dental Hospital, London.

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DISCUSSION

The Chairman thanked the author for presenting so well and so thoroughly a noteworthy case. Such a case was fascinating, but it was extremely difficult to assess the postural position.

Professor C. F. Ballard said he would like to congratulate Mr. Parker on this exercise in reasoning. He agreed with the reasoning. Perhaps others would concur in the view that it was necessary for such a paper to be printed and read in order to be fully appreciated. The paper had two particular aspects. One was its illustration of how lateral skull radiographs could be used for an analysis of what was happening during orthodontic treatment; but more important was its illustration of the way in which the analysis of radiographs could help to confirm, or otherwise, clinical concepts of mandibular posture.

The author had been trying to reason that there was in fact a true rest position for every individual, and here we had a disturbed rest position as a result of the occlusal abnormality, and when that was corrected the mandible would return and assume its true rest position, and the occlusal level had a definite relationship to that rest position. That reasoning was not as important to them as orthodontists as it was to the prosthetists. It was up to them to put forward all the evidence they could to help the prosthetists to come to a true physiological understanding of the true rest position.

Mr. Parker had pointed out that the final occlusal position might have been confused. A tremendous amount of vertical development would have taken place and it was possible that the original excessive vertical development had been completely eliminated. While Professor Ballard agreed with the author's reasoning, there were no doubt others who did not agree with it, and he would leave the author to them.

Mr. Steel asked what change in balance had taken place to allow the upper incisors to change without the lower incisors.

Mr. Parker said there had been a change in the inclination of the lower labial segment to the mandibular plane as a transient condition during treatment. With a change of mandibular posture and path of closure it might allow the position of balance to be slightly different from that of the before treatment condition.

Mr. A. J. Walpole Day said there was shown to be a change in the rest position and also in the occlusal level and those two changes had taken place at the same time. Professor Ballard suggested there was a relationship between the rest position and the occlusal level and rather hinted that the occlusal level changed because the rest position changed. Was it not true that there must be some relationship between the number of teeth in the occlusion and the occlusal level?

Mr. Parker believed that the number of teeth in contact was not important. The way they came into contact was the important fact. In the case presented the change in position of two teeth, the upper central incisors, had caused the change in occlusal level.

Mr. W. J. Tulley thanked the author and said he felt the subject matter was confusing because there were so many variables—growth, the habit postural position which it was difficult to assess, and the true rest position. He noted that there were three years between the radiographs. It would have been interesting to have had a radiograph immediately after the incisor relationship was corrected and to have noted the habit-posture change. The paper required careful reading so that the figures and the complex tracings could be closely examined. He would like to see one of these cases analysed in a similar way on a skeletal 1 base.

Mr. Parker said that he had not got a lateral skull tracing of the rest position or posture immediately after correcting the incisal relations, but only a recording of the occlusal level that was shown in the progressive vertical development. It would have been very interesting to have had such a record.

Mr. Jason Wood thanked Mr. Parker and asked whether he had known what was going to happen before he began treatment. There seemed to be quite a lot of similar cases where the incisor relationship was altered satisfactorily and the occlusal level did not rise, and he could not distinguish between the cases. Would the author enlighten him?

Mr. Parker said that the results were anticipated in so far as lateral skull tracings were taken.

Mr. Jason Wood said his question had not been answered. The result was foreseen, but how could one tell that sort of case from one where the intra-occlusal space did not alter?

Mr. Parker said that in certain cases there was a persistent excessive interocclusal clearance due to localized lack of development, and one could not predict this with certainty. However, in both types the early treatment of change of incisal relations was indicated. In most cases one would then expect vertical development of the buccal segments.

Mr. H. E. Wilson said the author assumed that the first position was a postural forward position and that the mandible moved upwards because of the forward posture. Could that not have been the true resting position and, because of the changed occlusion, might there not have been displacement of the mandible?

Mr. Parker said he would like to show again a slide that indicated the incisor relationship after treatment. (*Slide shown.*) This diagrammatic representation might be slightly exaggerated but undoubtedly the lower labial segment now appeared to occupy a position between the upper central and lateral incisors. The patient for some reason or another found this posture comfortable and in order to produce occlusion the mandible moved upwards and forwards.

Mr. Tulley observed that he thought the answer as to whether there was a lateral postural position could be determined with the electromyograph.

Mr. Parker said he realized that he was only presenting his findings on the analysis of one case. He would not come to any definite conclusions, but an indication was produced which tied in with some of his thoughts on the subject.

Professor Ballard said that the paper required further consideration. It was important to prove or disprove that the true rest position must be on a hinged axis movement and a distal displacement was quite separate from that. A displacing activity was quite distinct from a hinged axis movement.

The Chairman thanked Mr. Parker for his paper and answers to the discussion.

A CLASS III CASE TREATED WITH SIMPLE APPARATUS

A CASE REPORT

By **D. G. GOULD**, B.D.S., F.D.S., D.Orth. R.C.S.
Senior Registrar, Eastman Dental Hospital, London

THIS is the report of a Class III case which was treated by means of upper removable appliances and a lower fixed appliance in the comparatively short period of eight months.

The patient was first seen in December, 1953, aged 9, when the following observations were made.

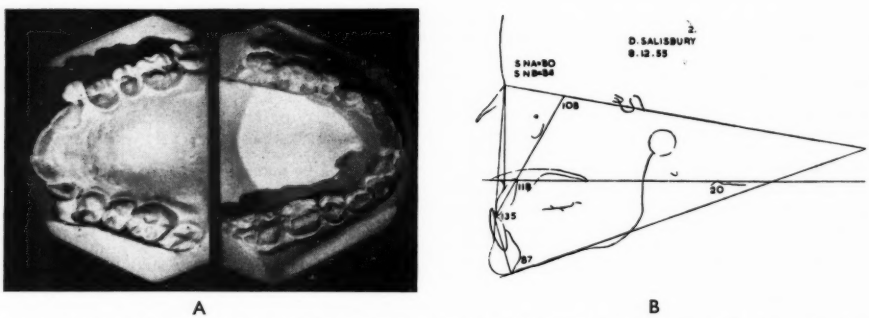
"Dental base relationship Class III, occlusal relationship Class III (Angle). The maxilla is relatively underdeveloped, but the mandible is not abnormally large. The soft tissue patterns of behaviour are normal. There has been early loss of deciduous molars and this has resulted in forward shift of all four first permanent molars.

"The lower right first permanent incisor and the left first and second permanent incisors and deciduous canine ($\overline{1|12C}$) occlude labial to the upper incisors. The lower right canine is rather upright and would be difficult to move distally and it might be better to extract lower right second incisor, upper right first premolar and upper and lower left first premolars, instead of four first premolars ($\frac{4|4}{2|4}$)."

Fig. 1.—Lateral views of study models, before treatment, December, 1955.

It was decided to delay treatment until all the premolars and canines had erupted, and so two years later in December 1955, at the age of 11, the three premolars and the lower incisor were extracted and treatment was started (*Figs.* 1, 2).

The tracing shows the upper incisors were relatively proclined at 118° to the maxillary plane. (Average 109°.) The lower incisors were relatively lingually inclined at 87° to the mandibular plane (the average on a maxillary–mandibular plane angle of 20° would be about 100°) and that the SNA angle was 80° and the SNB was 84°, a difference of —4°.



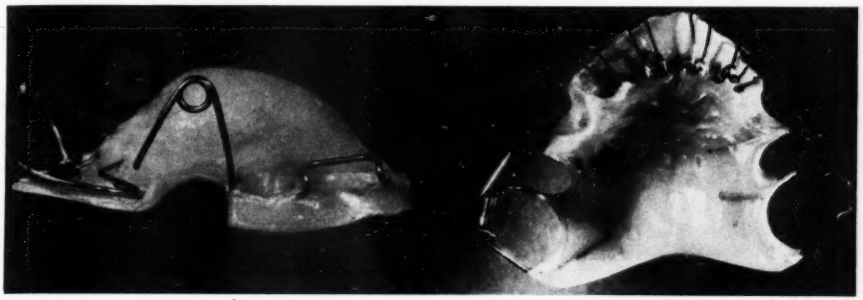
A B

Fig. 2.—Occlusal view of A, models and B, tracing of lateral skull radiograph, before treatment, December, 1955.

Active treatment was started in January, 1956, when an upper removable appliance was

Given at the Manchester meeting held on April 17, 1959.

fitted to retract the canines. The appliance was also fitted with finger springs to procline the upper incisors and buccal bite blocks to prop open the bite. In two months the canines were retracted sufficiently and proclination of the upper incisors was started (*Fig.* 3 A).



A B

Fig. 3.—A, Upper removable appliance with buccal springs to retract the canines, palatal springs to procline the incisors, and buccal bite blocks. B, Palatal view of removable appliance showing flapper springs to procline the incisors.

In April, 1956, bands were cemented on to the lower buccal teeth and retraction of the lower left canine was started by means of a push coil tied back on a round wire arch in order to provide space for alinement and retraction of the lower incisors.

Fig. 4.—Lateral views of study of models after eight months' treatment, August, 1956.

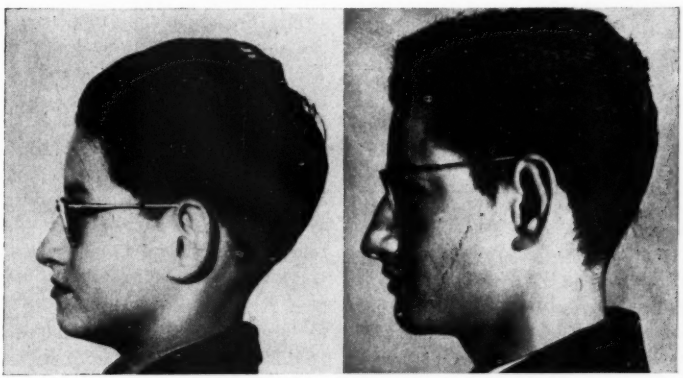


Fig. 5.—Before and after treatment profile photographs.

In June, 1956, a new upper removable appliance was fitted to continue proclination of the upper incisors (*Fig.* 3 B) and then, in July, as the lower left canine was retracted sufficiently, the lower incisors were banded for distal movement with intramaxillary elastics.

In August, eight months after treatment was started, the upper incisors were labial to the lower incisors (*Fig.* 4).

This was the end of the active treatment phase during which the lower incisors were

lingually inclined 7° from 87° to 80° and the upper incisors proclined 11° from 118° to 129° (*Table I*). There was a residual space of about 2 mm. distal to the upper left canine and a

Fig. 6.—Lateral views of study models, November, 1958.

small space (approximately 1 mm.) between the upper central incisors.

In the following month, September, as the upper incisors were held by the occlusion the upper appliance was discontinued and the lower bands removed and a lower removable retainer was fitted.

Table I.—Tracing Figures before, during, and after Treatment

	Nov. 1953	Dec. 1955	Aug. 1956	Nov. 1957	Nov. 1958
Upper incisors to maxillary plane.	121	118	129	125	125
Lower incisors to mandibular plane	87	87	80	77	76
Maxillary to mandibular plane angle	20	20	20	19	19
SNA	79	80	79·5	81	82
SNB	83	84	83	83	83·5
Difference	−4	−4	−3·5	−2	−1·5

The following year, in June, 1957, the lower retainer was discontinued. It will be seen from *Table I* that in November, 1957, the upper incisor–maxillary plane angle had reduced by 4° (129°–125°) and that the lower incisor–mandibular plane angle had reduced by 3° (80°–77°) since active treatment ceased.

The patient was last seen in November, 1958, when no retainer had been worn for seventeen months.

The before and after profile photographs (*Fig.* 5) reveal a marked improvement in profile. He had an acceptable occlusion and the upper incisors were clinically firm, suggesting that there was no occlusal trauma. The space distal to the upper left canine closed without treatment (*Fig.* 6).

OBSERVATIONS

1. This young boy had a short maxillary apical base. This was revealed by the upper second molars erupting in a buccal position and with a marked distal tilt. On the lateral skull radiographs it appears as though the teeth distal to the first permanent molars are piled one on top of the other.

2. Since this case was a true Class III malocclusion, and was not a postural case, treatment by simply proclining the upper incisors over the lowers without extractions was contra-indicated. The danger in that procedure is the probable production of a traumatic incisor relationship with subsequent resorption of the upper incisor apices and perhaps temporo-mandibular joint trouble later.

The aim of treatment was to tilt the lower incisors lingually as much as the upper incisors were proclined.

The final result in this case showed that the upper incisors had been tilted labially 7° (from 118° to 125°) and the lower incisors tilted lingually 11° (from 87° to 76°) (*Table I*).

3. Study of the SNA–SNB angles shows that before treatment the difference was −4°, indicating that SNB was greater than SNA. When the upper incisors were placed in labial relation to the lower incisors, as the result of treatment (August, 1956), the SNA–SNB difference was −3·5°. This indicates that the normal labial segment relationship was achieved by change in the dento-alveolar structures and that there was very little, if any, postural element in the original condition. If the mandible had been postured forward one would expect to see a change in the SNA–SNB difference immediately that treatment had established the normal incisor relationship.

Similarly, study of the maxillary to mandibular plane angle shows that there was very little change in the before and after treatment values, indicating that this case was not complicated by overclosure.

4. In this case delay in starting active treatment was rewarded by a good result which only entailed eight months' active treatment. If treatment had been started when the patient was first seen, the appliance therapy would have been spread over a much longer period and the case management would have been much more involved.

Acknowledgements.—I am grateful to Mr. S. Granger McCallin, Consultant to the Eastman Dental Hospital, for his permission to publish this case and for his help in preparing it for publication; and to Mr. W. J. Morgan, A.R.P.S., for his work on the slides and photographs.

DISCUSSION

The Chairman thanked Mr. Gould and said he knew only too well what a lot of hard work went into collecting material for case reports. Perhaps he would give a little more information concerning the muscle behaviour in this case?

Mr. Gould said in reply that in the original diagnosis he noted that the soft tissue patterns were normal, so it would not have affected the treatment.

Mr. H. G. Watkin thanked Mr. Gould for the paper and said he wondered whether it was really a Class III case. It seemed to be Class I, and that was why there was such a good result.

Mr. Gould said there was a Class III dental base relationship. It was discovered from the radiographs that the upper incisors were relatively proclined and the lower incisors were relatively retroclined, which meant the uppers were leaning forward and the lowers were leaning back, and yet the lower incisors still occluded in front of the upper. The molar relationship was slightly complicated because there had been movement of the molars due to early loss. Therefore, the molars themselves were not a true indication. But if one examined the canines one found they were in a Class III relationship.

Mr. H. E. Wilson thanked Mr. Gould and said he would like to have one point put clearly and in simple language. Did the author believe he had altered the dental base relationship?

Mr. Gould said that he did not really say that. But there had been a change in the SNA–SNB points; there was no doubt about that. The SNA–SNB points were on the alveolar structures and so it was possible to change them. There might have been some improvement in the dental base relationship, not due to his own efforts but due to nature.

The Chairman then thanked Mr. Gould.

Elastic-thread Ligature as an Auxiliary for Tooth Movement

The use of elastic thread ligature to effect different kinds of tooth movement is described. The rubber, prepared for orthodontic use, is covered by closely woven nylon thread and is available in three sizes.—GOLDSTEIN, M. C. (1959), *Amer. J. Orthodont.*, **45**, 6.

Bilateral Dens en Dente

This rare type of development anomaly, a tooth within a tooth, and named dilated composite odontome by Rushton, has been recorded in the bilateral form by few observers. It is claimed that Salter wrote of the first Dens en Dente in 1855, and it has since been accurately described, among other workers, by Rushton. Various theories have been put forward to explain the phenomenon and the supporters of the one currently accepted consider that the structure of Dens en Dente is an invagination of a single enamel organ, although not all are agreed as to how this comes about.

Rushton believed it to be a rapid and abnormal growth of cells of the deep surface of the enamel organ resulting in invagination of the dentine papilla. This growth process "presses the incompletely calcified dentine walls and papilla outwards so they are thinned and the deeper part of the bony crypt becomes enlarged. The part already calcified cannot be expanded, so in cases where the pressure is great the tooth becomes rapidly wider from the cusp rootward. The central pressure must force the crown in a superficial direction and may help to cause its conical shape."

Two cases of bilateral Dens en Dente are presented, both in teenage females.—MORGAN, G. A., and others (1959), *J. Canad. dent. Ass.*, **25**, 361.

BRAINS TRUST

The President, introducing the members, said that they had been chosen for their wide interests and their wide topographical representation: Professor Ballard was Professor of Orthodontics at the University of London; Dr. Russell Logan, Consultant to the South-eastern Scottish Regional Board; Mr. Peter Burke, Consultant, Newcastle United Teaching Hospitals; Dr. Dockrell, from Dublin and Cork. There was no truth in the rumour that the team had been sitting up all night with their year-books on dentistry.

Question 1: "In an official letter it was stated that the essence of treatment by the Andresen appliance is to move the upper buccal teeth distally. Do the panel agree?"

Dr. Russell Logan said he was the most unsuitable person to answer the question because he did not understand the implications. Where planes were cut in certain cases there were little shiny marks showing that the planes were bearing on the teeth. But they had all seen cases where an apparatus was inserted and, for some reason, it was not possible to cut the planes. In spite of that, reduction of a disto-occlusion had taken place.

Mr. Dockrell said he used the appliances: sometimes they worked and sometimes they did not. He did not know what determined the difference in response.

Mr. Burke: With reference to the Andresen appliance he preferred to use it for the treatment of uncrowded Angle's Class II, division 1 malocclusions in the mixed dentition where the lower incisors were not already proclined. It appeared to work by a form of intermaxillary traction. When a protrusive bite was taken the mandible was displaced forwards. Some patients, if asked about it, mentioned a little stiffness at the angle of the mandible in the mornings and it was in those patients that a good result was obtained. The mandible liked to stay in the rest position. When a muscle is stretched it responds reflexly by contracting, so that when the mandible was displaced anteriorly by the Andresen appliance those muscles which were being stretched would contract. They would therefore be exerting pressure to pull the mandible back to its rest position. This pressure was transmitted through the lower teeth to the Andresen appliance, and hence exerted distal pressure on all upper teeth. The reaction to this force was exerted by the Andresen appliance in the form of mesial pressure on the lower teeth. One therefore proclined lower incisors as the whole of the lower arch came forward and the whole of the upper arch was retracted. He had seen on those few cases for which he had cephalometric records evidence of proclination of mandibular incisors.

Professor Ballard believed that there was further evidence to support Mr. Burke's view. If an analysis were made, both with and without an appliance, one found a continual activity of the retracting muscles of the mandible when the appliance was in the mouth. One should put an appliance in the mouth only after analysing the morphological features and having decided it would produce certain tooth movements. If those movements were not obtained within a month or two one should discard the appliance because the lower arch could be pulled forward. The appliance would move upper buccal segments distally, but there should be plenty of room at the back of the mouth. The procedures of treatment had to be planned just as carefully as when any other kind of appliance was used.

Question 2: "Does the Brains Trust agree that 'One swallow does not make a malocclusion'?"

Professor Ballard said that one swallow did not make a malocclusion. Presumably the question related to the atypical swallowing behaviour which was attributed to malocclusion. The other morphological features were sometimes even more important. One saw typical tongue thrusts in potentially normal occlusions and the only abnormality was a reduced overbite. It was another factor in association with the atypical behaviour of incompetent lips on the variations of dental base relationship.

Mr. Dockrell believed that Professor Ballard had summed up the position neatly. He would question the importance of certain factors, too. Abnormal swallowing by itself in a potentially normal case would not always cause malocclusion. It would be very useful if somebody would produce an analysis of the frequency of atypical or abnormal swallows with absolutely normal occlusions. There were so many references to the presence of a malocclusion and the association of an atypical swallow. It was glibly assumed that the swallow had caused the malocclusion and never the other way round.

Dr. Russell Logan said that there were two factors, the tongue factor and the lip factor. In cases with a marked Class II jaw relationship, one observed the person who grinned and pulled the corner of her mouth upwards and backwards when she swallowed, and one wondered whether it was possible for her to swallow in any other way. There seemed little doubt in such cases that the lip action did contribute to the malocclusion. But it was not the determining factor at all. It would indeed be interesting to work out the association of abnormal swallows with normal occlusions.

Professor Ballard said that Mr. Dockrell and Dr. Russell Logan were entirely right. Probably those in London had said more about atypical swallows than had other orthodontic centres, and they had to admit that a very high proportion of those cases which five or six years ago they would have labelled as "atypical swallowing behaviour" were in fact cases of adaptive behaviours to other features. What we must try to distinguish between in the future (and it was difficult to do) was the true innate variations of tongue behaviour and the secondary adaptive habits. It could occur with all types of abnormality.

Question 3: "Does the panel believe that the removal of first, second, or third molar in the upper or lower jaw can ease crowding of the front teeth in any considerable way?"

Mr. Burke said the question must be dealt with piece by piece. First, would the removal of the upper first permanent molar relieve incisor crowding? In his experience it might relieve incisor crowding if it were carried out early enough, but as soon as the occlusion was locked, particularly if there were crowding in the canine region, the position would not be relieved to any great extent. In other words, if it were wished to treat anterior crowding by extraction of the upper first permanent molars, one had to be prepared to start treatment immediately to

Held at the Manchester meeting on April 18, 1959.

angles would represent normal growth and change in habit posture (*Table I*).

The sum of (1) and (2), i.e., normal growth and vertical development, is readily obtained from the occlusal level radiographs before and after treatment (*Table II*).

1. *Normal Growth and Postural Changes* (*Fig.* 3).—4.P. on 1.P. superimposed on S and (S–N) line.

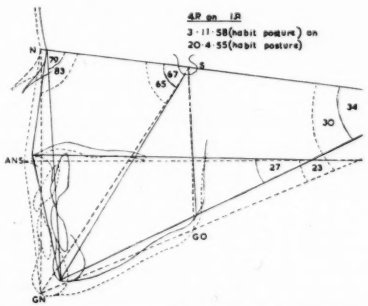


Fig. 3.—Superimposed radiograph tracings of habit postures before and after treatment, showing normal growth and change of habit posture.

Distance Changes.—From *Table I* it will be seen that while the N–ANS distance increased by 4 mm. the ANS–GN distance only increased by 2 mm. Growth studies in this age range have been carried out by Brodie (1953) and Meredith, Knott, and Hixon (1958). The latter workers calculated mean values and individual variation for the index.

$$\frac{\text{Nasal Height} \times 100}{\text{Subnasal Height}}$$ at various ages.

From calculations based on this work I would have expected an increase of 3–4 mm. in the ANS–GN distance.

Angular Changes.—In *Table I* the following angles decreased during the treatment period: N–S–GN by 2°, Mx–Md by 4°, and SN–GOGN by 4°. Brodie (1953) in his growth study found in one case only out of 19 a decrease in the N–S–GN angle. Although one cannot predict growth, the small increase in ANS–GN distance plus the decrease in N–S–GN angle along with a 4° decrease in the Mx–Md angle are to me suggestive of normal growth and change in habit posture rather than growth alone. The condylar and rotation axis changes which are mentioned later would also tend to bear this out.

2. *Normal Growth and Vertical Development of the Dento-alveolar Structures* (*Fig.* 4).—4.O. on 1.O. superimposed on S and (S–N) line.

Distance Changes.—From *Table II* it will be seen that while the N–ANS distance increased by 4 mm. the ANS–GN distance increased by

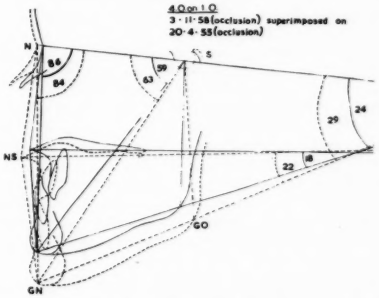


Fig. 4.—Superimposed radiograph tracing of occlusion before and after treatment, showing normal growth plus vertical development.

13 mm. The ANS–GN increase is far too great to be accounted for by normal growth (Meredith, Knott, and Hixon, 1958). I think the explanation lies in the elimination of the

Table II.—Readings from Radiographs showing Occlusion before and after Treatment

	1.O.	4.O.	Difference between 1.O. and 4.O.
N–ANS	55 mm.	59 mm.	+ 4 mm.
ANS–GN	53 mm.	66 mm.	+13 mm.
N–S–GN	59°	63°	+ 4°
S–N–GN	86°	84°	− 2°
Mx–Md	18°	22°	+ 4°
SN–GOGN	24°	29°	+ 5°

mandibular overclosure, although to this must be added normal growth. Working on mean figures it would appear that the overclosure was somewhere in the order of 10 mm. and normal growth around 3 mm., which gives

retract buccal segments. That applied to a greater extent with the second and third molars. In the lower jaw the extraction of the first permanent molar would, in general, relieve anterior crowding, provided the occlusion was not locked.

Dr. Russell Logan said that it was necessary to decide in the first instance whether there was an element of crowding present or not. The crowding element accounted for probably one-third of their troubles in orthodontics, and for some reason it had never proved an attractive study to their more scientifically minded brethren. The first question was whether there was going to be enough room on the jaw for the complete dentition of the size which was present. If there was an element of crowding present and molars were taken out there would be produced, in the upper jaw particularly, spacing in the front of the mouth. If there was not a crowding element present all that would be produced was a gap.

In the lower arch it was doubtful whether relief of crowding in the incisor region would be obtained by extraction of a lower first molar, even if there was a slight element of crowding present. If there was no element of crowding present at all, as happened in cases where the teeth were very small or in Class III cases where there was gapping, there would, of course, be no relief. The question was related strictly to the diagnosis as to whether or not there was a crowding element present in the dentition. If there was, one would get space in the front, in the upper jaw particularly. It might occur in the lower jaw, but that was not so likely.

Professor Ballard said that if upper first permanent molars were removed there was less likelihood of relief of canine lateral crowding in the upper than in the lower, because the upper sevens' forward movement was so quick that space might not be gained. In the lower jaw, on the other hand, the movement was not so quick.

Mr. Dockrell said he presumed the questioner had in mind an established crowding in the incisors rather than interceptive treatment for an ultimate crowding. It was less a matter of diagnosis than what Professor Radden had the previous evening called "prediction". It was established that there was a tendency for the lower incisors to straighten, anyway, during the mixed dentition period, and that must be separated from any effect due to the extraction of the lower molars. In Ireland he saw a number of cases that had lost four first permanent molars very early. He did not give automatic treatment, but kept them on a very short string and kept watch. The majority of cases ended with appliances, but there was occasionally a satisfactory straightening out.

The President said he was sure Mr. Dockrell's experience was not confined to Dublin. They all encountered it frequently.

Mr. Burke said he had nothing to add.

Dr. Russell Logan said that, as with all orthodontic questions, the answer was: "They do and they don't." There were so many factors to take into account, apart from mere crowding. They must consider the relation of the lower base to the upper. The most vital thing was the timing of the extraction, which greatly influenced the result.

Question 4: "Does the Brains Trust consider orthodontic treatment for æsthetic reasons only, a legitimate use of National Health Service money?"

Mr. Burke asked whether one could carry out æsthetic orthodontic work without improving function. Mr. Dickson had summarized the answer in his book by saying that the aims of treatment should be stability, function, æsthetics in that order. If it were not for the desire for æsthetic treatment the Society would be a lot smaller than it was and one must put æsthetics very high in considering aims of treatment. But one had to bear in mind the other two factors at the same time before expending public money.

Professor Ballard said he had no hesitation in saying that money should be spent on orthodontic treatment which was purely æsthetic. Instead of using the word "stability", he would suggest "harmony". They were reducing the malocclusion. In many cases they were not able to take teeth to the position of Class I occlusion, but they were putting them more in harmony with the features of the individual and obtaining results that were æsthetically more satisfactory. A recent paper dealt with work done on the rehabilitation of reform school children. There was considerable success as a result of straightening noses and curing squints and removing nævi and other deformities. The children responded very satisfactorily to æsthetic operations. Orthodontics was in the same field and embraced the mental well-being of the individual.

Dr. Russell Logan said he believed that the Ministry's policy was that the degree of mental fitness which it was their duty to provide was that which was necessary for the maintenance of general health. For some children malocclusion was definitely upsetting mental development. Some girls complained that their friends called them "Buck-teeth". However, one sometimes wondered whether some of the more theoretical "issues" were properly charged against public money.

Mr. Dockrell said that Ireland was not so concerned with the question. One of their main grounds for treatment was æsthetic and he knew of no evidence that there was an association between malocclusion and caries or periodontal disease which justified the automatic treatment of the malocclusion. He did believe the treatment of malocclusion for æsthetic reasons benefited a patient psychologically and that this amply justified the treatment.

Professor Ballard said they were not spending other people's money through the National Health Service; they were spending their own money, and they must think very carefully about the way they spent it.

Question 5: "To what extent, if any, does the panel think that soft-tissue activities can be modified by orthodontic treatment?"

Dr. Russell Logan said he kept wondering why orthodontists could not speak plain English. What was "soft-tissue activity"? Was it the behaviour of the soft tissue?

Mr. Dockrell said that the people in Ireland were lucky in that they did not have soft tissues.

Mr. Burke said that Mr. Dockrell was probably quite right. There was either more soft-tissue activity around London or perhaps there was more acuity in the detection of this activity. Certainly in potentially competent lips with teeth resting between upper and lower lips if the teeth were retracted the lip posture was more satisfactory. In other types of mildly incompetent lips he sometimes used oral screens and thought that they improved lip posture. It might be a question of maturation of lip behaviour and that was really what was improving lip posture.

Professor Ballard said they were now getting a clearer picture of soft-tissue factors. The picture emerging was that basically there were patterns of posture and patterns of behaviour arising from the central nervous system,

probably as a result of inherited factors, and superimposed on those patterns were adaptive patterns—habit postures and habit activities adapted to the other factors that were inherited. The adaptive postures modified themselves. He did not like the suggestion that some of the changes were what they had in the past called "maturation". Careful study would indicate there was not a change in basic characters of individuals as a result of maturation.

Mr. Dockrell said it must be correct to assume there were genetic patterns and that superimposed on them were bound to be adaptive changes. What interested him was the sensible question posed the previous day: How was one to know beforehand? They were inclined to say that a change was adaptive and then, if it did not alter, to say that it was inherited.

Dr. Russell Logan said that he could not believe that queer habits of use of the soft tissues did not disappear as a result of a child growing up. Quite a large number of children at the age of 5 years showed queer lip movements; a smaller proportion of adults showed them. Children grew out of these habits.

Question 6: "What are the Brains Trust's views on the actual cause of the pain associated with the so-called Costen's syndrome?"

Dr. Russell Logan said the pain was probably caused by spasm in the muscles of mastication operating in an environment which was unfavourable to their normal life and operation. The bony parts to which they were attached had altered their shape and their relationship one to another, and the muscles were in a continual state of partial spasm. Possibly the lower jaw altered its position.

Mr. Burke said that the kind of cases he had seen were Angle's Cl. II, div. 1 or div. 2 malocclusions on post-normal base relationships with excessive anterior overbites. Temporary relief could be obtained by the local surface application of ethyl chloride, which stopped the pain and suggested that the pain was due to muscle spasm. Orthodontic treatment to reduce the excessive anterior overbite could be of help to these patients. He was not in favour of a permanent bite-raising appliance in the form of occlusal caps on cheek teeth only, although this would give temporary relief of pain.

Professor Ballard said that there was overwhelming evidence to suggest that the pain was in the muscle, and recognition of this was rather important. The people treating Costen's syndrome did so by functional analysis and the treatment of disturbed mandibular activity and they got quick relief of pain. The oral surgeons who did not know anything about functional analysis took out condyles, but admitted they could not see any cause of pain in the joint.

Mr. Dockrell said that he agreed.

Question 7: "The floor of the nose of a child is smaller than an adult's. It is reasonable to assume that there is lateral expansion in the molar region at the apical base. Do expansion plates assist that growth and thereby increase the width of the apical base?"

Mr. Burke said that there were two types of lateral expansion; in the first expansion was carried out at the normal rate, and in the second the rate of expansion was very rapid. The latter was called "dysjunction" and apparently parted the two halves of the maxilla. He had no experience of this type of expansion. In the literature one could find a case history in which three expansion screws were used in rapid succession. When the molar teeth were palpated it was noticed that the central incisor on the same side also moved. There was no delay in placing this case into retention. Some work was now being done on the Continent using "dysjunction" to disconnect the vomer before repositioning of segments in the early treatment of the cleft palate patient.

In his opinion an expansion plate used at the normal rate did not increase the width of the apical base. The main growth vectors of the face were downwards and forwards. The growth of the dental bases was more or less fixed in its lateral dimensions from a fairly early age. The only area in which the lateral dimension of the bases increased was posteriorly as the dental base extended posterolaterally to accommodate the molar teeth. The lateral dimensions of the arch remained reasonably stable, excepting the intercanine increase occurring at the time of eruption of the incisor teeth. This varied from child to child, with a mean of about 2 mm. in the upper arch. It might be reasonable to anticipate that expansion and help it on its way with a midline expansion plate, but he did not use lateral expansion for this purpose.

Mr. Dockrell said that he, for one, used it. Perhaps people in Dublin were very old-fashioned. There were two problems. One was springing, which lateral expansion plates could do quite frequently. If they were cut well away from the incisors and allowed to act on the cheek teeth it was found that the incisors splayed. At the age when they were used there was little lateral growth going on, and the width in the first molar region was a very stable dimension, although occasionally it was found to drop or rise a little.

Professor Ballard said he would rather not get involved with this question. He did not think one could permanently expand. The people who were trying to do it were those who believed that a constricted nasal airway could result in lack of oxygen for the individual and flat-feet!

Dr. Russell Logan said the lateral wall could move outwards without any effect on the apical base at all. As to whether expansion plates assisted growth and thereby increased the width of the apical base, he did not think they did. The inter-molar width increased in some children without treatment, while in others it did not. In some cases it might diminish.

He was once privileged to have as a patient a little girl with marked bimaxillary crowding. She had a French mother. Her teeth were crowded in both the upper and lower arches. He was proposing certain treatment when the child suddenly went home to France.

The upper arch was expanded about 3·5 or 4 mm. and the child still had a lower incisor crowding. Over the following three months the lower arch also expanded, and it was interesting to observe the improvement in the incisor crowding, though it was doubtful whether it would be maintained. He was unfortunately prevented from following the case further.

The President said that the Brains Trust had had to put up with a great deal and their job was not a light one. There was always a certain amount of mischievous glee in watching the examiners being examined, but the panel had managed to answer the questions concisely with both sparkle and humour. The session had been interesting and unfortunately could not be prolonged. He thanked all those who had submitted questions, and apologized to those whose questions had not been dealt with. They would all want to indicate their appreciation of the panel, who had stood up to their ordeal so well. (*Applause.*)